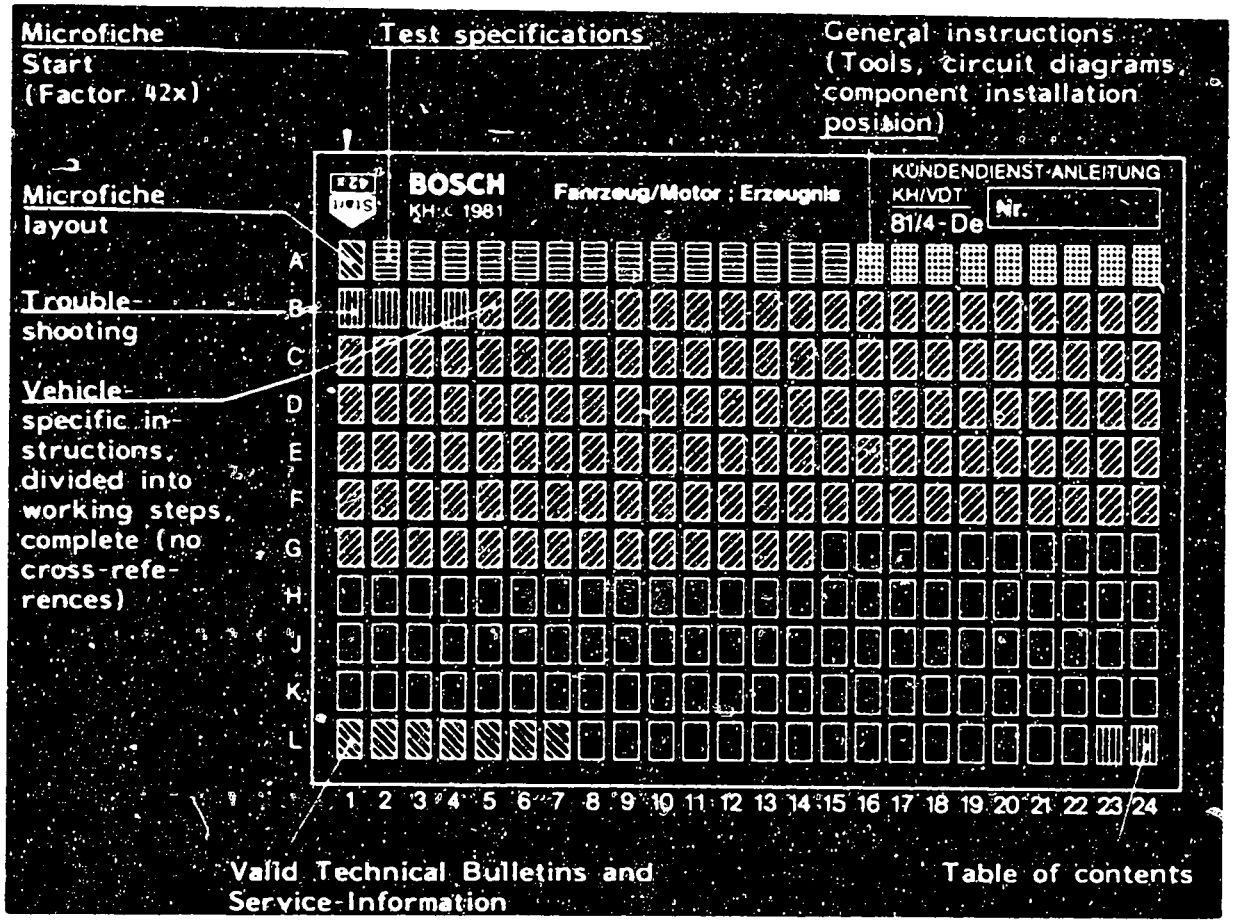
Microfiche layout



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E16	Product/assembly/test step Vehicle/engine	

Coordinate

3. Limits of section

Beginning	Mid-section	End	One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar. |

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

C6

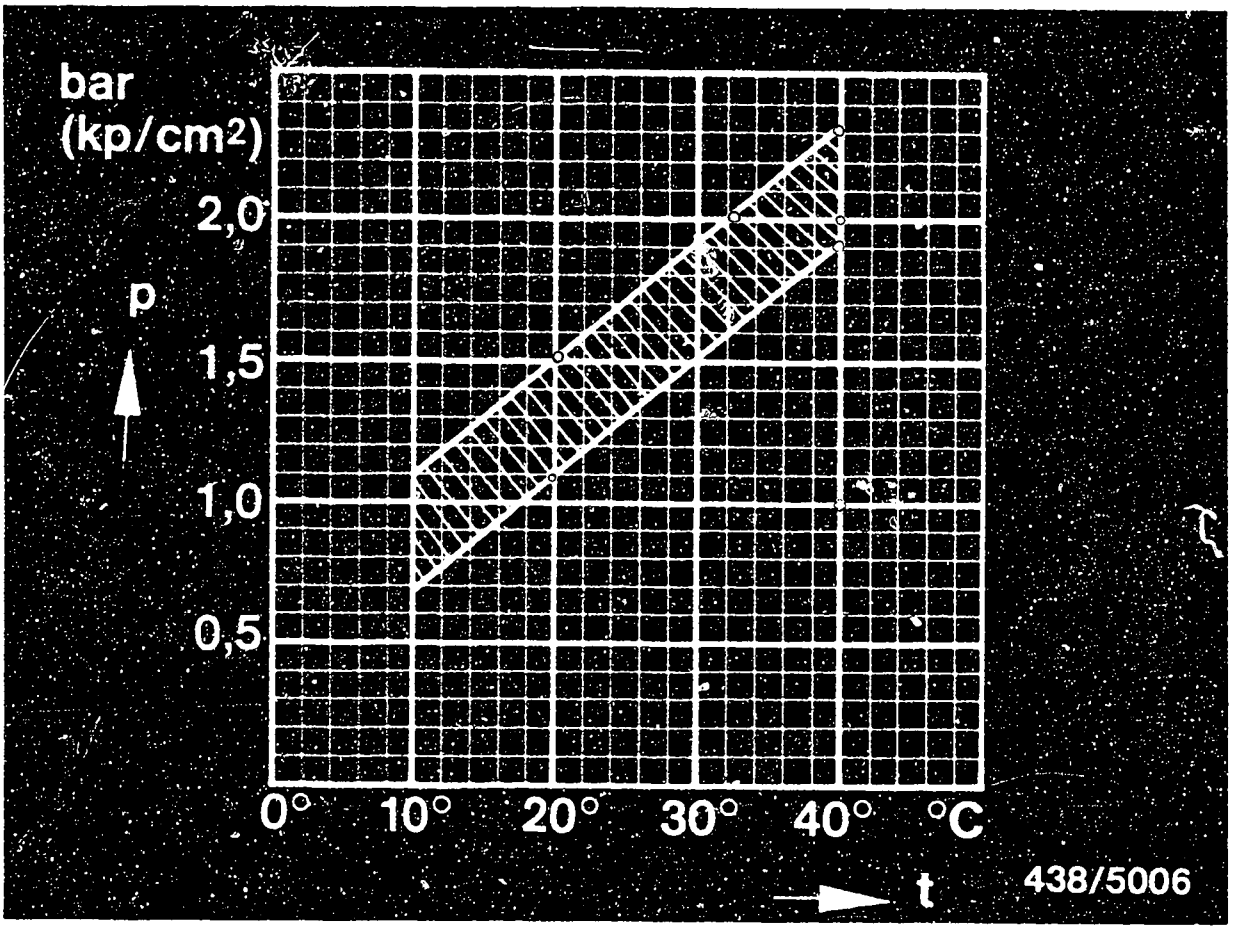
A1	Trouble-Shooting Plan	⬇

1. Test specifications

1.1 Electric fuel pump

B 23

Test step	Test specifications
Fuel delivery:	min. 930 cm^3/30 s



p = Control pressure (gauge pressure)
t = Ambient temperature

C 13

1.2 Control pressure "Cold"

For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.

Setting value: 510...550 mbar
(385...415 mmHg)

Part no. of warm-up regulator: 0 438 140 038
0 438 140 052
(Version for intake-manifold-pressure-controlled full-load enrichment)

Test step	Test specifications*

1.3 Control pressure "Warm"

C 13

Part no. of warm-up regulator: 0 438 140 038
(Version for intake-manifold-pressure-controlled full-load enrichment)

- Test at atmospheric pressure
  (Without vacuum): 3.0...3.4 bar (3.1...3.5 kgf/cm^2)

- For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.

  Setting values:
  510...550 mbar
  (385...415 mmHg): 3.4...3.8 bar (3.5...3.9 kgf/cm^2)

- Leak test on full-load diaphragm
  Maximum pressure drop from setting value: 100 mbar (75 mmHg)/15s

*Pressures in the test-specification table are given in bar (gauge pressure) and/or in kgf/cm^2 (gauge pressure).

Test step	Test specifications*

1.3 Control pressure "Warm"

C 13

Part no. of warm-up regulator: 0 438 140 052
(Version for intake-manifold-pressure-controlled full-load enrichment)

- Test at atmospheric pressure (without vacuum): 2.7...3.1 bar (2.8...3.2 kgf/cm^2)

- For testing connect vacuum pump to intake-manifold connection of warm-up regulator.

  Setting values:
  510...550 mbar
  (385...415 mmHg): 3.4...3.8 bar (3.5...3.9 kgf/cm^2)

- Leak test on full-load diaphragm
  Maximum pressure drop from setting value: 100 mbar (75 mmHg)/15 s

*Pressures in the test-specification table are given in bar (gauge pressure) and/or in kgf/cm^2 (gauge pressure).

Test step		Test specifications*
1.4 Primary pressure:		**D 13**
Fuel distributor 0 438 100 025 (Model 78/79)	checking value	4.5...5.2bar(4.6...5.3 kgf/cm^2)
	setting value	4.7...4.9bar(4.8...5.0 kgf/cm^2)
Fuel distributor 0 438 100 080 (from 1980 model)	checking value	4.7...5.4bar(4.8...5.5 kgf/cm^2)
	setting value	4.9...5.1bar(5.0...5.2 kgf/cm^2)

1.5 Leak test — **D 21**

	Fuel accumulator 0 438 170 010 (78/79 model)	Fuel accumulator 0 438 170 029 (as from 1980 model)
Minimum pressure after 10 minutes:	2.0 bar (2.1kgf/cm^2)	2.7 bar (2.8kgf/cm^2)
after 20 minutes:	1.7 bar (1.8kgf/cm^2)	2.6 bar (2.7kgf/cm^2)

1.6 Injection valves: — **E 20**

Part number 0 437 502 014 (78/79 model)
Opening pressure: 2.7...3.8bar(2.8...3.9kgf/cm^2)

Part number 0 437 502 019 (as from 1980 model)
3.0...4.1bar(3.1...4.2kgf/cm^2)

*Pressures in the test-specification table are given in bar (gauge pressure) and/or in kgf/cm^2 (gauge pressure).

F11

1.7 Fuel distributor

Delivered-quantity comparison

Fuel distributor
Part No. 0 438 100 025
0 438 100 080

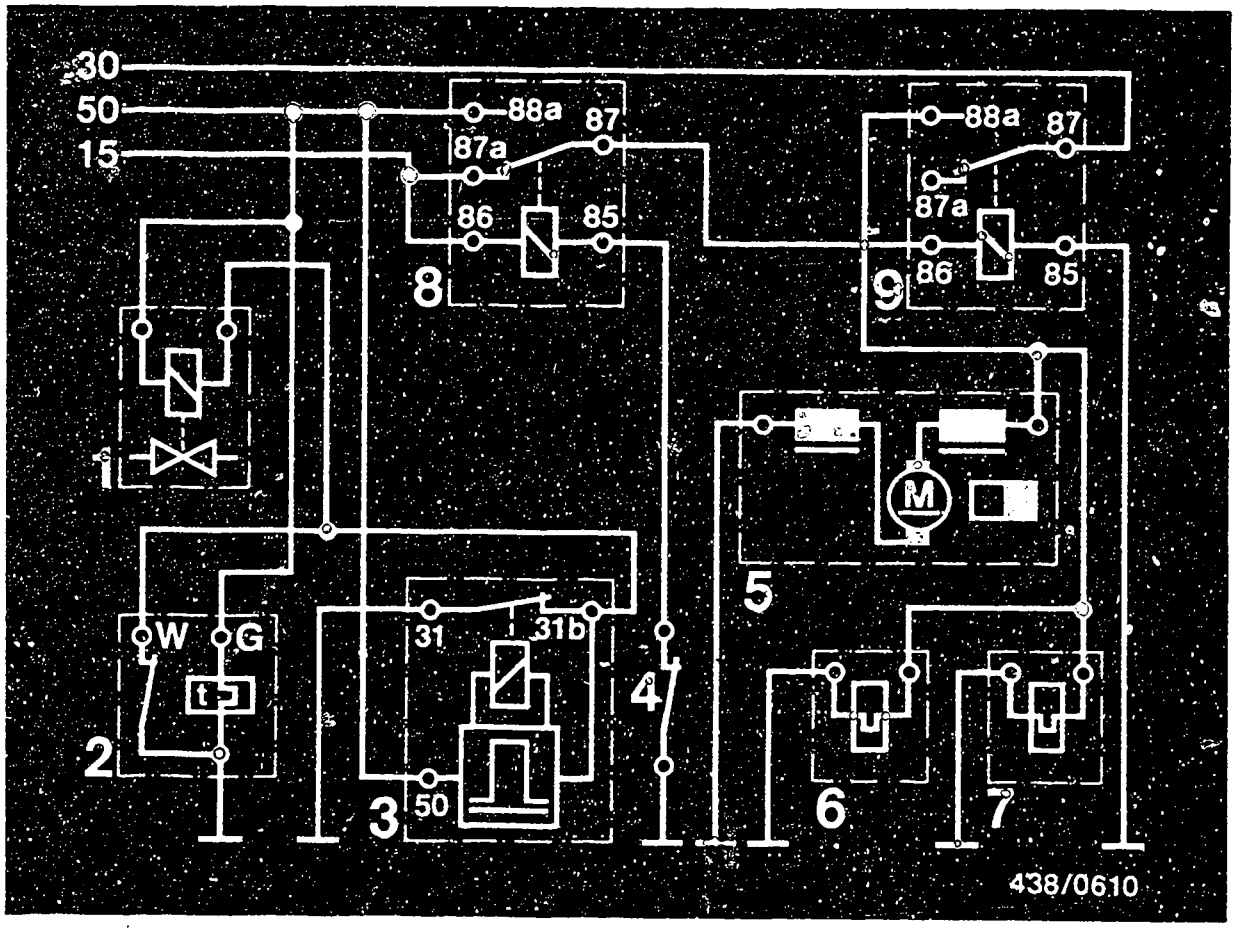
	Setting Point cm^3/min	Max.allowable delivery cm^3/min
Idle	6.0	6.8
Part load	40.0	44.0
Full load	145.0	158.0

G4

1.8 Idle-speed adjustment

- Idle speed:
  All models with
  manual transmission: 875...925 min^{-1}
  automatic transmission: 825...875 min^{-1}

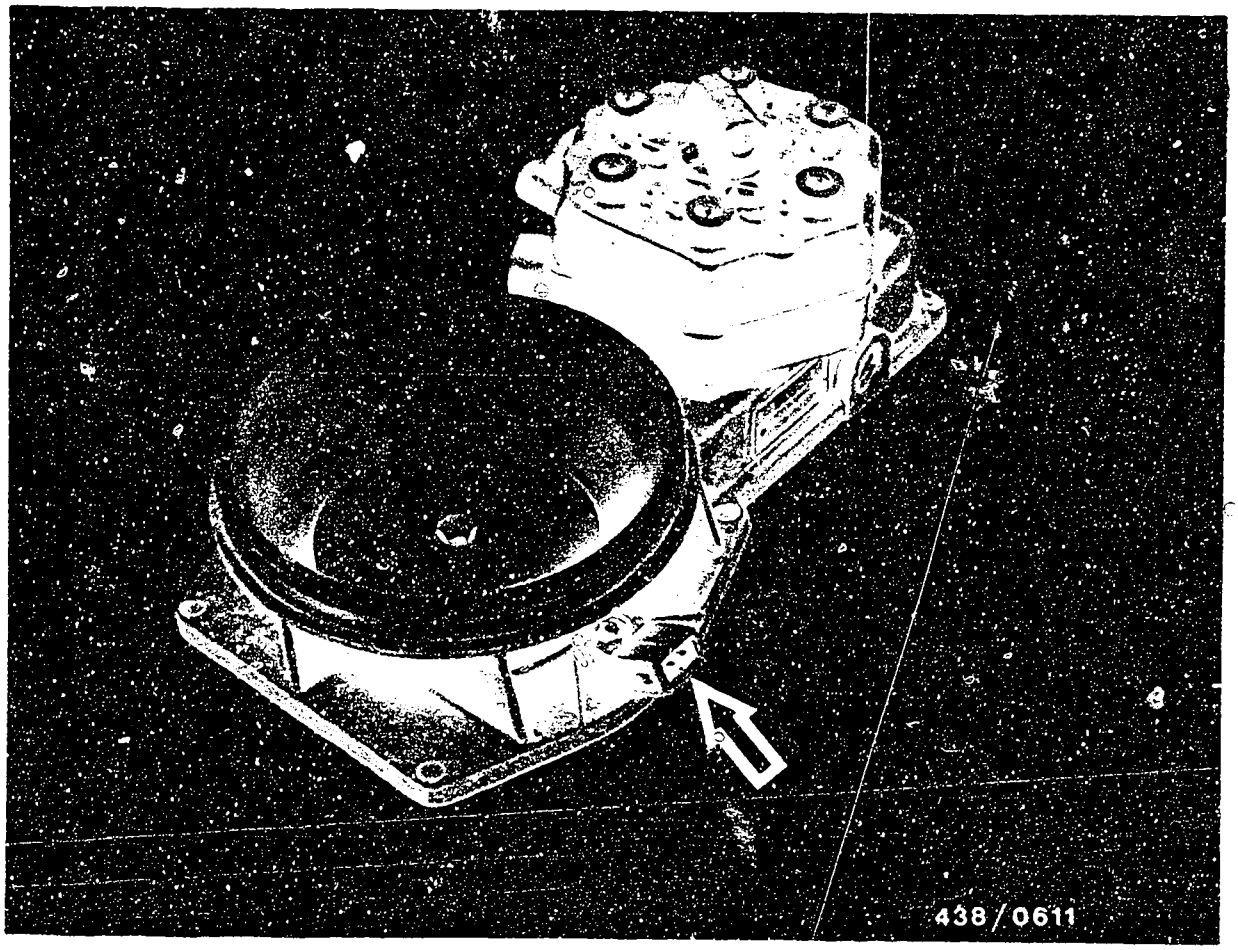
- CO concentration
  (% by vol.)
  All models: 1.0...1.5



2. Electrical safety circuit

2.1 Circuit diagram

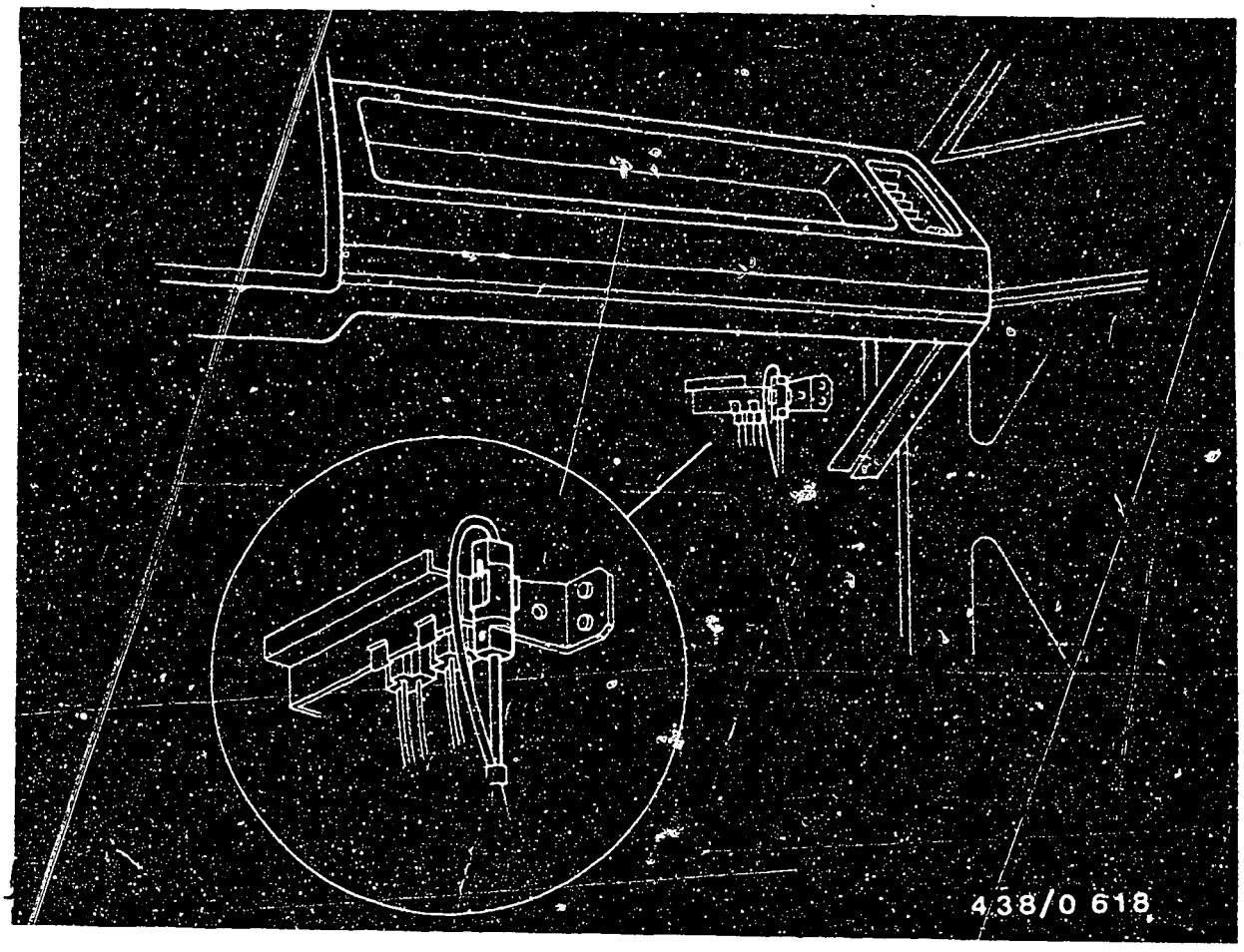
1 = Start valve
2 = Thermo-time switch
3 = Impulse relay for warm-start mixture enrichment (from 1980 model)
4 = Safety contact in the air-flow sensor
5 = Electric fuel pump
6 = Warm-up regulator
7 = Auxiliary-air device
8 = Relay 1
9 = Relay 2



2.2 Bridging the safety circuit

In order to bridge the safety circuit it is sufficient to switch on the ignition and to remove the double connector from the socket on the air-flow sensor (arrow).

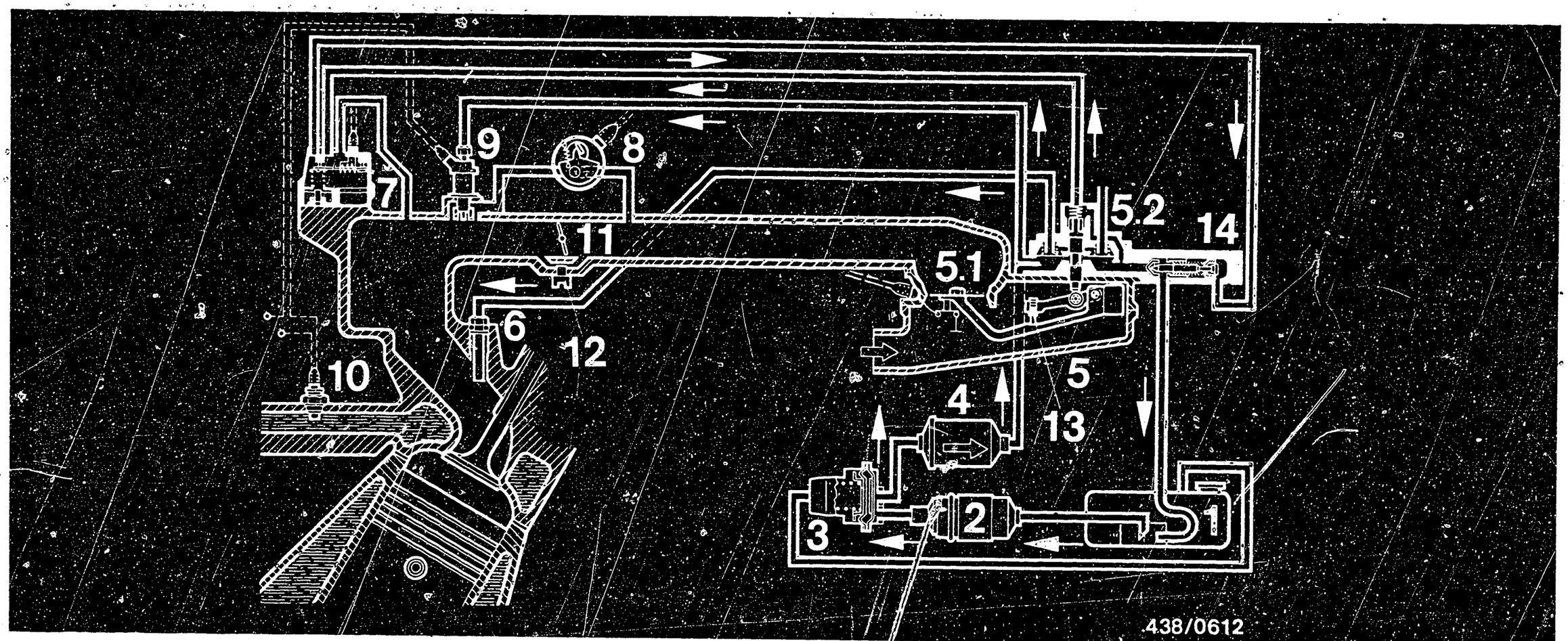
The components electric fuel pump, warm-up regulator and auxiliary-air device are triggered via relays I and II whereby the ignition must be on and the contact in the air-flow sensor open (air-flow sensor plate raised).



2.3 Relays of the safety circuit

The relays and a fuse (terminal 30) for the electric safety circuit are mounted on a mounting piece under the instrument panel on the right-hand side of the vehicle on the Granada model (picture).

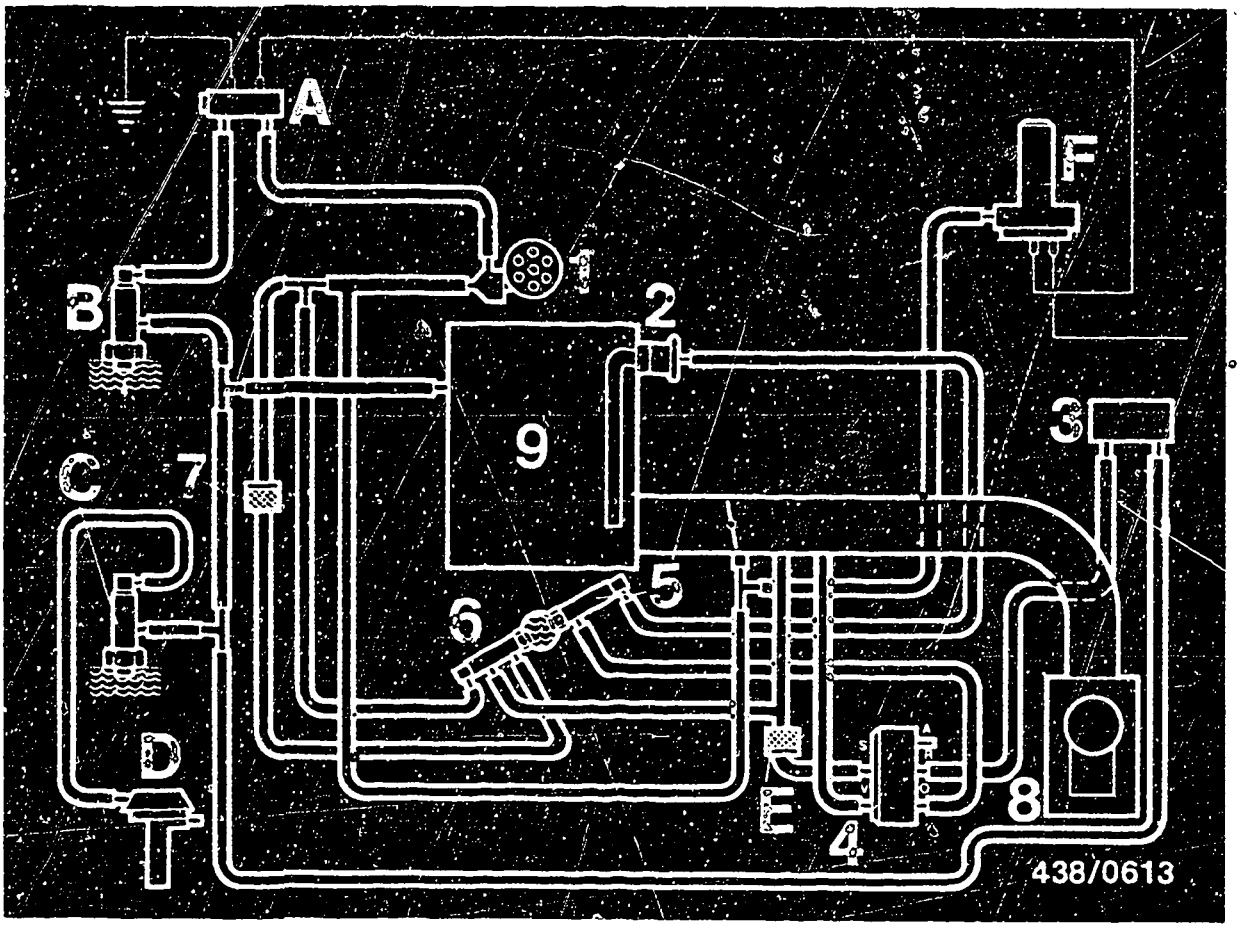
On the Capri model this mounting piece is located on the left-hand side of the vehicle, likewise under the instrument panel.



3. Diagrams

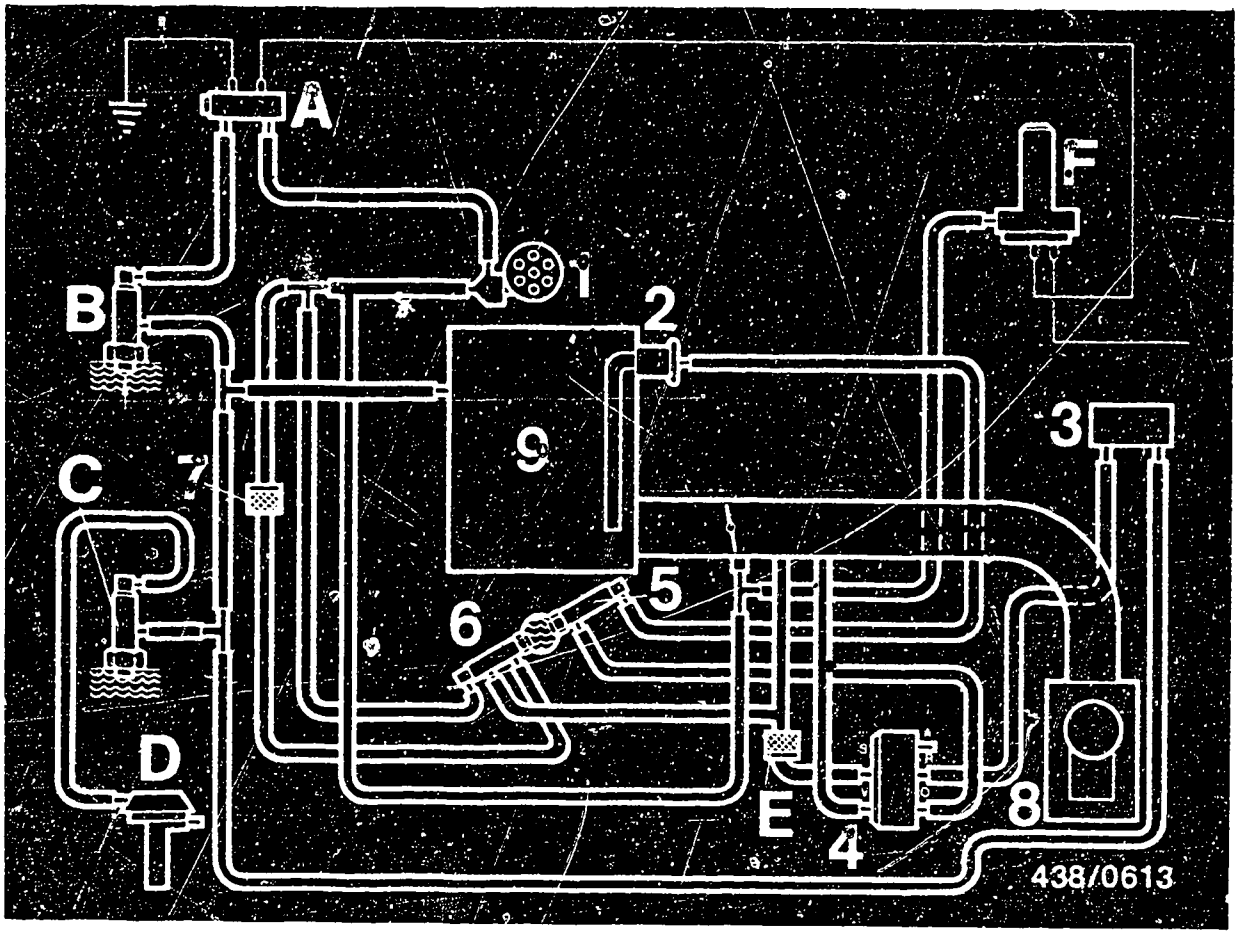
3.1 Diagram of fuel lines

1 = Fuel tank
2 = Electric fuel pump
3 = Fuel accumulator
4 = Fuel filter
5 = Mixture-control unit
5.1 = Air-flow sensor
5.2 = Fuel distributor
6 = Injection valve
7 = Warm-up regulator
8 = Auxiliary-air device
9 = Start valve
10 = Thermo-time switch
11 = Throttle valve
12 = Idle-speed-adjusting screw (bypass)
13 = Idle-mixture screw
14 = Primary-pressure regulator with push valve



3.2 Exhaust-gas purification system (only Granada of Sweden version)

1 = Ignition distributor with vacuum advance mechanism (advance/retard)
(Manually-shifted transmission).
Ignition distributor with vacuum advance mechanism (advance)
(Automatic transmission)
2 = Exhaust-gas recirculation valve
3 = Vacuum tank
4 = Vacuum booster
5 = Exhaust-gas recirculation thermostat valve
6 = Ignition advance thermostat valve (automatic transmission only)



7 = Ignition advance delay valve
8 = K-Jetronic mixture-control unit
9 = Air-intake distributor

Additional components on vehicles with manually-shifted transmission:

A = Solenoid-operated valve
B = Ignition retard thermostat valve
C = Thermostat valve for delay valve
D = Delay valve for ignition advance
E = Vacuum-holding valve
F = Vacuum-controlled switch

4. General information

4.1 Introduction

This repair manual refers to the Ford vehicle models

Granada 2.8 i, from 1978 model
Capri 2.8 Injection, as from the start of production, i.e. 1981.

It has been possible to combine these two different models because they are equipped with the same engine type and are thus identical with regard to K-Jetronic components. The only difference is the installation position of the electric fuel pump, accumulator and fuel filter.
The manual gives a concise description of the testing and adjustment operations to be performed on the vehicle on the K-Jetronic.
All the system components are dealt with in separate working steps with the corresponding test specifications.
In addition to this repair manual the appropriate testing and repair manuals will, of course, be issued for every other vehicle type equipped with the K-Jetronic.
The K-Jetronic differs from other known fuel-injection systems in terms of both construction and operation.
In order to be able to carry out the testing procedures described in this manual - and therefore to be able to assess the components - the K-Jetronic and its operation should be clearly understood. The essential points of the operation and construction of the K-Jetronic are described in Technical Instruction VDT-U 3/1 En.

A pre-requisite for trouble-shooting on the K-Jetronic is that the ignition is in order and that the engine has no mechanical faults.

The individual test sections of these repair instructions are detailed and self-contained. Trouble-shooting on a particular item is therefore possible without the whole test program having to be carried out for each fault.

The trouble-shooting plan on the coordinates B1 - B4 should make it easier to ascertain the test sections necessary for particular faults.

According to the symptom detected by you or the customer, select the possible cause in the trouble-shooting plan. The coordinates at the end of the cause column indicate the corresponding test section with the relevant test specifications.

Important note:

If any fuel connections are loosened, parts removed, even in the vacuum system, then new seals must always be used when reconnections are made or when the parts are reassembled.

Utmost cleanliness is essential on all work on the K-Jetronic. All fuel connections should be thoroughly cleaned before they are dismantled.

4.2 Design

The entire system of the K-Jetronic in the Ford Granada and the Ford Capri corresponds to the basic design as described in Technical Instruction VDT-U 3/1.

4.3 Electrical safety circuit:

The electric fuel pump, warm-up regulator and auxiliary-air device are controlled by 2 relays whereby the control relay switches as a function of the safety contact in the air-flow sensor (air-flow sensor plate stop).

As usual, the start valve is triggered by the thermo-time switch during cold starting in accordance with the engine temperature.

4.4 Hot-starting device:

In order to improve the hot-starting performance, the Ford 2.8 i engines are equipped as standard as of the 1980 model with a pulse relay for the intermittent triggering of the start valve.

This hot-starting device corresponds to our suggested solution in the case of hot-starting problems.
The pulse relay used by Ford is not made by Bosch and has slightly different pulse times from the Bosch relay 0 340 000 003. The described hot-starting device has, in some cases, been retrofitted by Ford workshops in earlier Granada vehicles.

4.5 Other equipment:

The Granada vehicles in the Sweden version are equipped with exhaust-gas recirculation and additional control components for ignition advance.
This exhaust-gas purification system with its numerous connections on the intake system should be borne in mind when trouble-shooting (e.g. leak test on the intake system).

5. Test equipment and tools

- Pressure tester KDJE-P100 (previously KDEP 1034)

  For testing all fuel pressures and testing for leaks.

- Connecting-parts set KDJE-P100/10 (previously KDEP 1034/10)

  For connecting the pressure tester to the control-pressure port of the fuel distributor.

- Adjusting wrench KDEP 1035

  For adjusting the idle-mixture-adjusting screw in the mixture-control unit (CO adjustment).

- Guide ring KDEP 1040/10 (dia. 80 mm)

  For centering the air-flow sensor plate in the air-flow sensor.

- Tester for delivered quantity comparison KDJE-P200 (previously KDJE 7451)

  For comparing the fuel delivered from the individual fuel-distributor outlets.

- Graduate (commercially available, capacity approx.1.5l)

  For measuring the delivery of the electric fuel pump.

- Electric connecting cable (test lead).

  KDJE 7450/70 for the direct connection of components to be tested, e.g. cold-start valve.

- Set of tools for the removal and fitting of idle-CO-anti-tamper device of air-flow sensor.

  (e.g. No. 131 090 from the firm Cartool, Hans Schubert KG, Unterer Grasweg 88,D-8070 Ingolstadt).

- Valve tester KDJE-P 400 (previously KDJE 7452).
  For testing the injection valves.

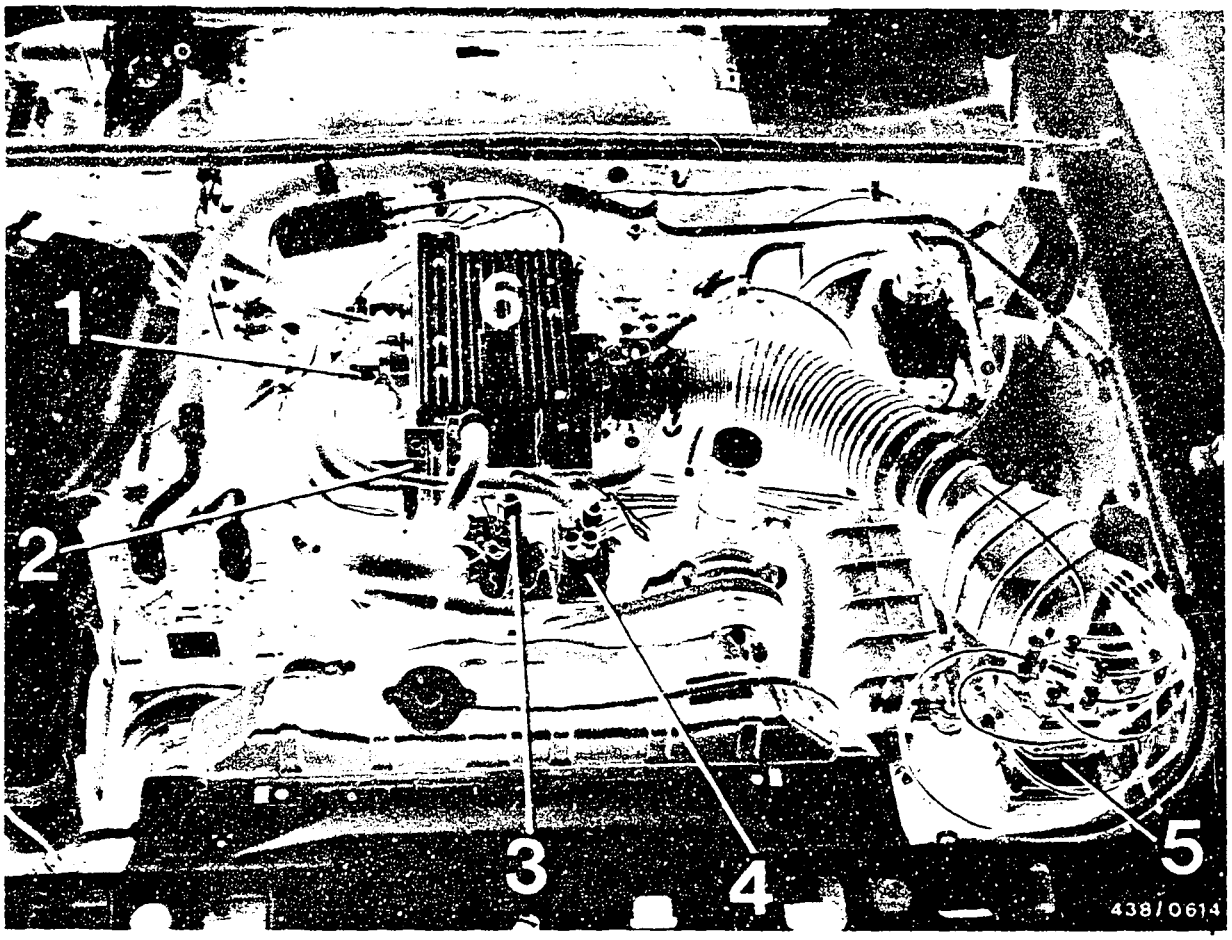
Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral Spirits 135) or
Bosch order designation VS 14 942-CH
previously part number 5 973 340 650
The Bosch calibrating fluid can be obtained in 5 l metal cans from the following supplier:
Firma
Oskar Gnamm GmbH & Co
D-7531 Kämpfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids. Even with calibrating fluid, be sure to observe the local official regulations.

- Tachometer (commercially available).
  For idle-speed adjustment.

- CO meter (commercially available).
  For idle-speed CO adjustment.

- Vacuum pump (commercially available).
  For testing warm-up regulators with intake-manifold-pressure-dependent full-load enrichment.
  e.g. Hand vacuum pump "Mityvac" from
  Firma Korinth
  Ludwig-Kloos-Straße 21
  6450 Hanau 7 (Steinheim)

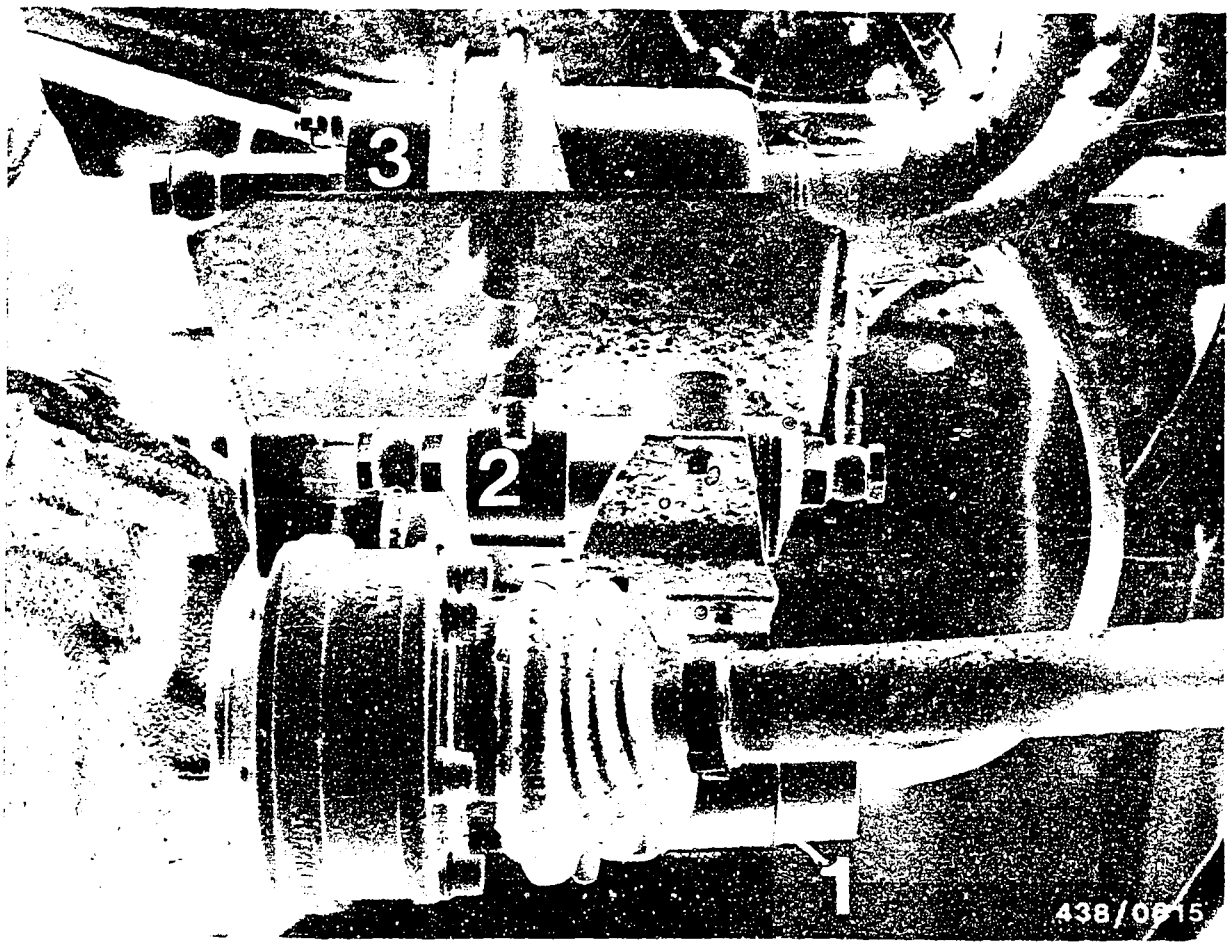


1 = Start valve
2 = Auxiliary-air device
3 = Thermo-time switch
4 = Warm-up regulator
5 = Mixture-control unit
6 = Air-intake distributor

6. Installation position of individual components

6.1 Installation position of components on engine:

The injection valves (not visible in the picture) are plugged into the intake-manifold unit beneath the air-intake distributor.

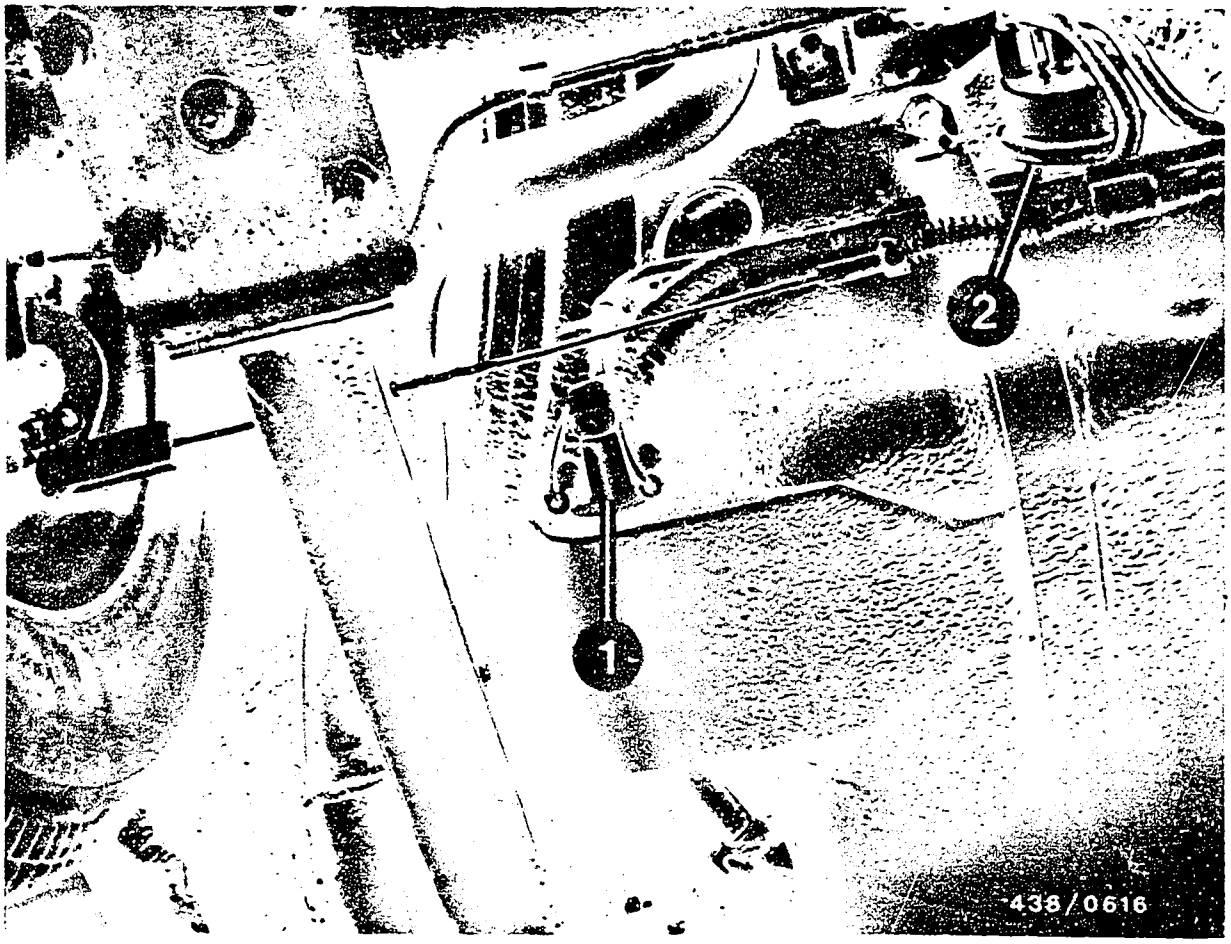


1 = Fuel accumulator
2 = Fuel filter
3 = Electric fuel pump

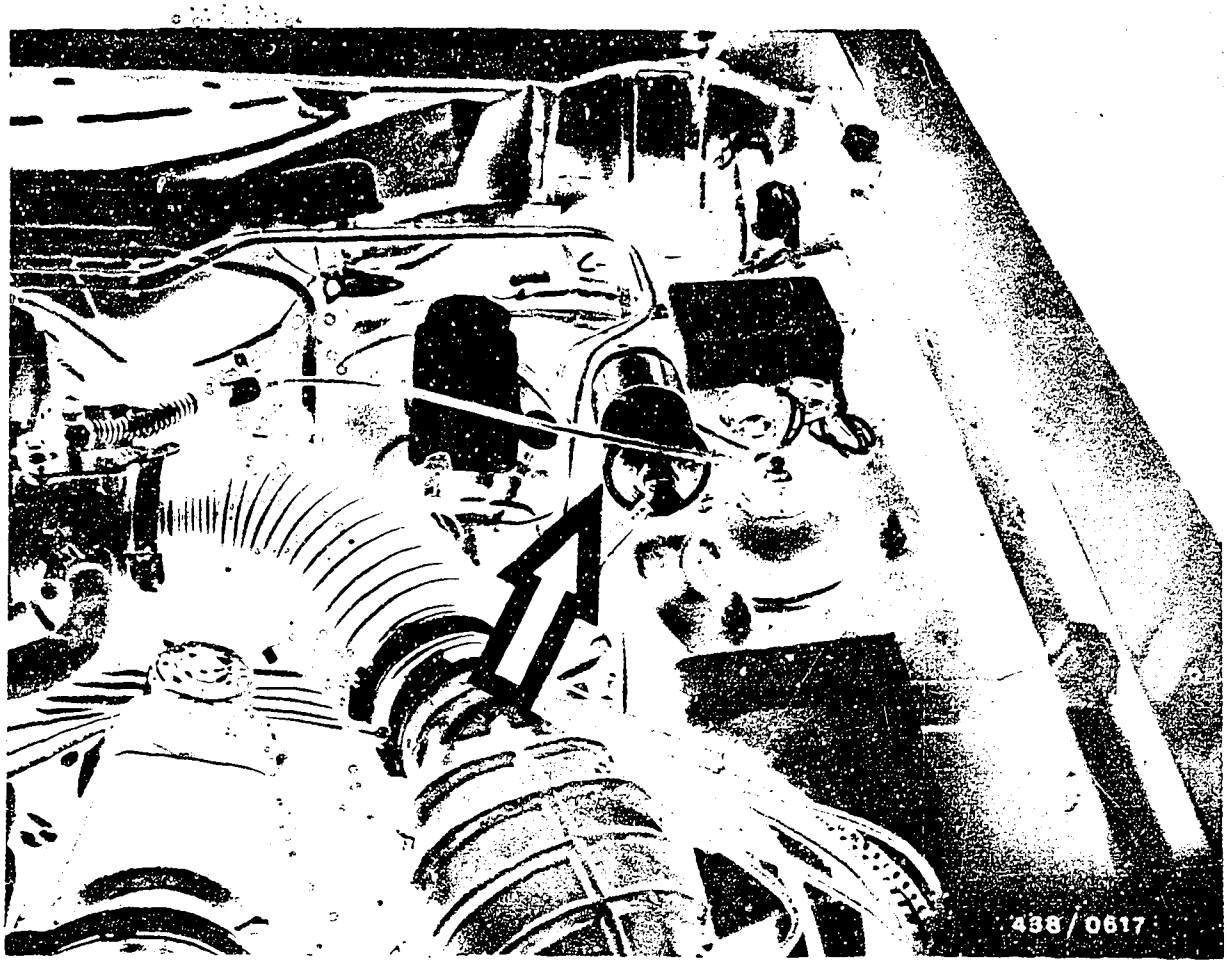
6.2 Fuel-supply components:

The installation position of the electric fuel pump, fuel filter and fuel accumulator on the Granada model.

All three components are mounted on a common mounting piece behind the rear axle (on the right-hand side as viewed from behind the vehicle).



Electric fuel pump (1) and fuel accumulator (2) on the Capri model.



The fuel filter is located in the engine compartment on the Capri model (on the left-hand side as viewed from behind the vehicle) (arrow).

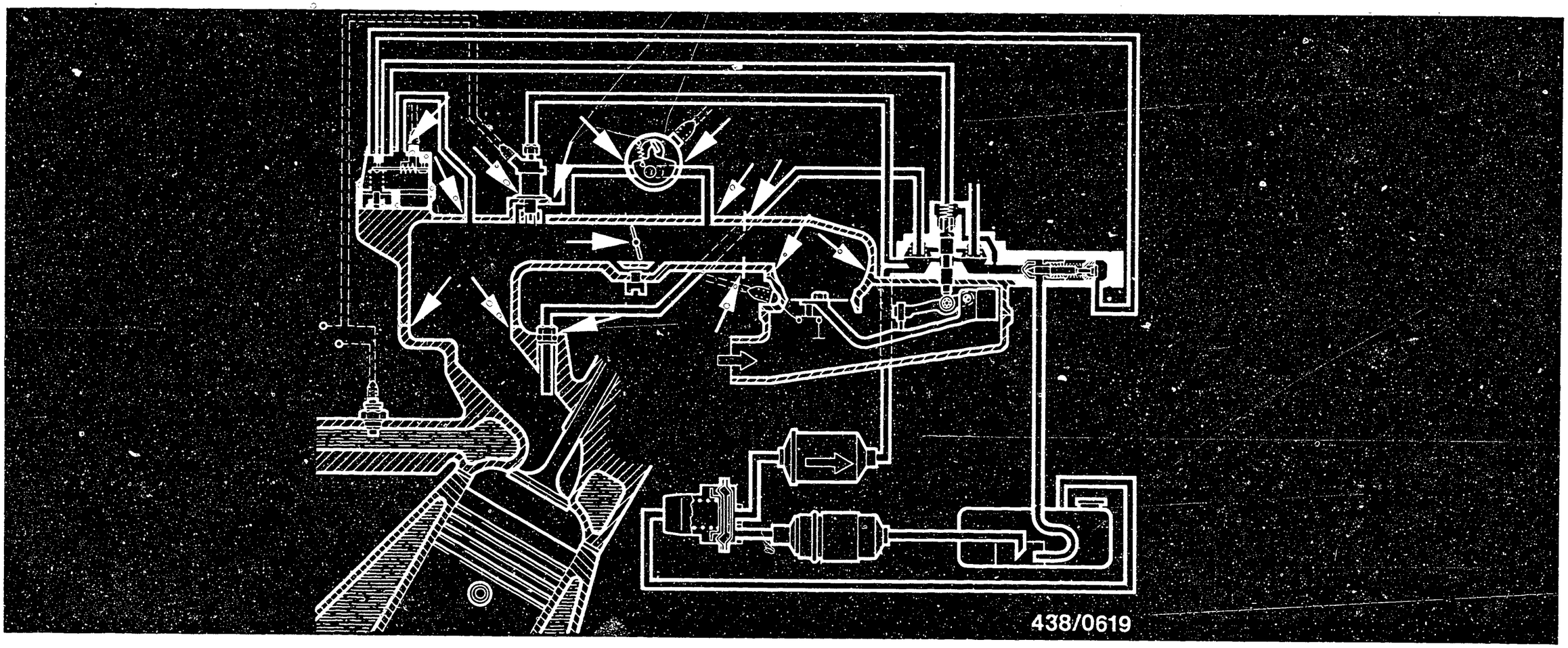
7. Trouble-shooting chart (see also Coordinates B3/B4)

*Note: The warm-start device mentioned at the bottom of the "Cause" column is fitted as standard equipment in vehicles built as from 1980. In earlier Granada models this device was only to be found in a few vehicles. Supplementary fitting in older vehicles is always to be recommended when no satisfactory warm start can be achieved under cause of fault 2 after all other possible causes have been tested and eliminated. The installation is described in Coordinate L5.

Customer complaint (fault symptom)								
1. Engine does not start, or starts poorly, in cold condition								
2. Engine does not start, or starts poorly, in warm condition*								
3. Irregular idling during the warm-up phase (shakes)								
4. Irregular idling with warm engine (shakes)								
5. Engine does not draw gas, burbles								
6. Engine misfires when operating on the road, high load								
7. Insufficient power								
Cause								Coordinates
	●	●	●	●		●	Vacuum system leaking	B 5
●	●		●	●	●	●	Air-flow sensor lever and/or control plunger not moving smoothly	B 7
	●						Position of the air-flow sensor plate incorrect	B16
●		●					Auxiliary-air device does not open	B21
●	●				●		Electric fuel pump not operating	C 1
●							Cold-start system defective	C 9
		●	●				Cold-start valve leaking	C11
				●			Excessive fuel delivery for control-pressure circuit	C15
●		●					"Cold" control pressure outside tolerance	C13
	●		●	●	●	●	"Warm" control pressure too high (after warm-up)	C13
			●	●		●	"Warm" control pressure too low (after warm-up)	C13
					●	●	Primary (system) pressure outside tolerance	D13
	●						Overall fuel system leaking	D21
●	●	●	●		●		Injection valves leaking, opening pressure too low	E20
●	●	●	●			●	Unequal fuel delivery (imbalance of fuel delivery)	F11
●	●	●	●	●			Basic idle adjustment incorrect	G 4
						●	Throttle plate does not open completely	G 4
	●						Warm-start device (impulse relay) not working	L 5

Customer complaint (fault symptom) continued

8. Engine runs on after being switched off ("diesels")	9. Fuel consumption too high	10. Flat spot during acceleration	11. CO concentration during idling too high	12. CO concentration during idling too low	13. Idle-speed cannot be adjusted (too high)	14. Engine starts but then immediately stops	Cause	Coordinates
		●		●			Vacuum system leaking	B 5
●		●	●	●			Air-flow sensor lever and/or control plunger not moving smoothly	B 7
●							Position of the air-flow sensor plate incorrect	B16
							Auxiliary-air device does not open	B21
					●		Auxiliary-air device does not close	B21
						●	Electric fuel pump not operating	B23
							Cold-start system defective	C 9
●	●		●				Cold-start valve leaking	C11
		●				●	Excessive fuel delivery for control-pressure circuit	C15
		●				●	"Warm" control pressure too high (after warm-up)	C13
	●	●	●			●	"Warm" control pressure too low (after warm-up)	C13
		●				●	Primary (system) pressure outside tolerance	D13
							Overall fuel system leaking	D21
●							Injection valves leaking, opening pressure too low	E20
		●					Unequal fuel delivery (imbalance of fuel delivery)	F11
●	●	●	●	●			Basic idle adjustment incorrect	G 4
							Throttle plate does not open completely	---



Working steps

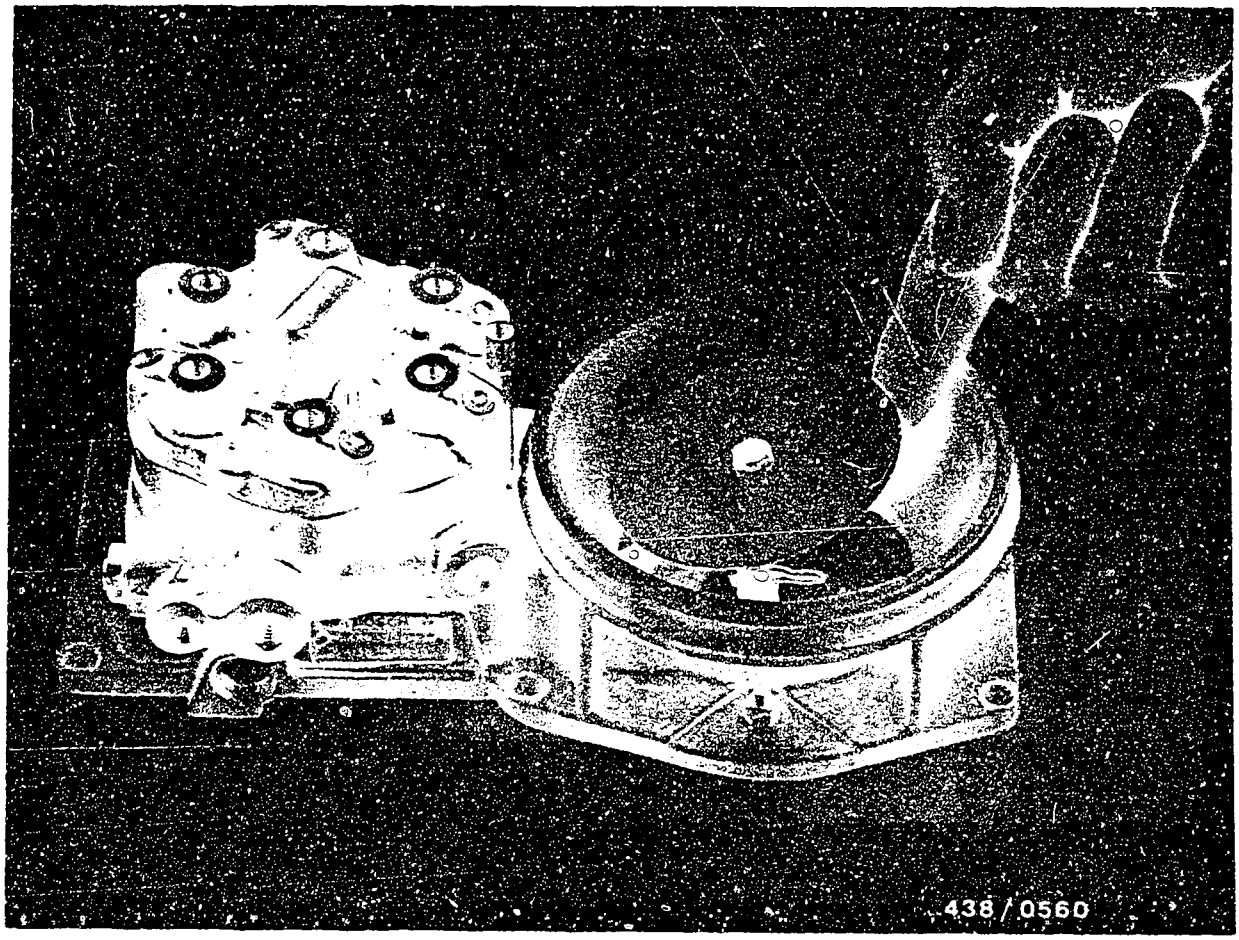
8. Check the air-intake system (vacuum system) of the engine for leaks.

The arrows in the diagram show typical points where leaks can occur. Check by performing a visual inspection or, in cases of doubt, as follows: Disconnect the hose from the outlet of the auxiliary-air device and blow air through this hose into the intake system using a compressed-air gun. The throttle valve is to be fully open. Brush connection points with soapy water, or spray with leak detector (e.g. Güpoflex). Under no circumstances may combustible liquids be used when testing for leaks.
The formation of bubbles or foam indicates a leak.
If a leak has been eliminated, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.
Idle-speed adjustment is described on Coordinates G4.

9. Check the control lever in the air-flow sensor and the control plunger in the fuel distributor for ease of movement.

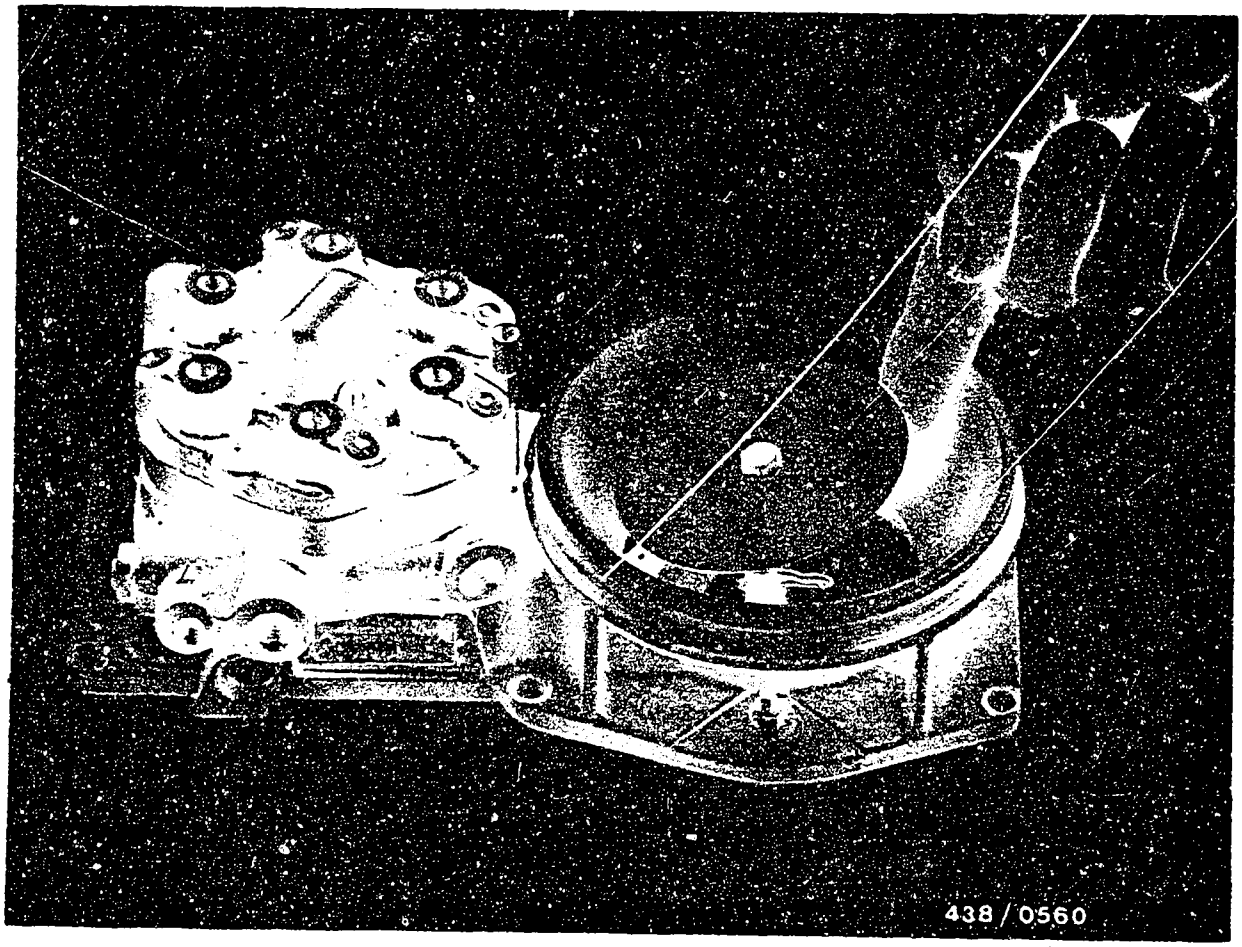
9.1 Preparations

- Engine temperature not below +20°C.
- Remove the rubber hood so that the air-flow sensor plate becomes accessible.
- Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
This results in application of the control pressure to the control plunger in the fuel distributor.



9.2 Check that the control lever moves freely

Raise the air-flow sensor plate by hand (updraft) and release again. The sensor plate snaps back into the zero position and bounces up about twice from the spring-loaded stop. If the control lever does not move freely, first release all fastening screws holding the air-flow sensor to determine whether housing deformation is the cause of the problem. If the problem is solved by loosening the fastening screws, the seal between the air-supply housing and air-flow sensor should be changed (Ford parts).
Tighten the screws uniformly cross-wise.
If the housing is not deformed; then the air-flow sensor must be repaired or replaced.



9.3 Check that the control plunger moves freely.

Raise the air-flow sensor plate by hand (updraft). The same resistance must be felt over the entire movement.

Move the sensor plate rapidly back to a position just in front of the zero stop. The control plunger follows only sluggishly, but must make noticeable contact with the sensor plate lever. If this condition is fulfilled, the control plunger can be considered to move freely.

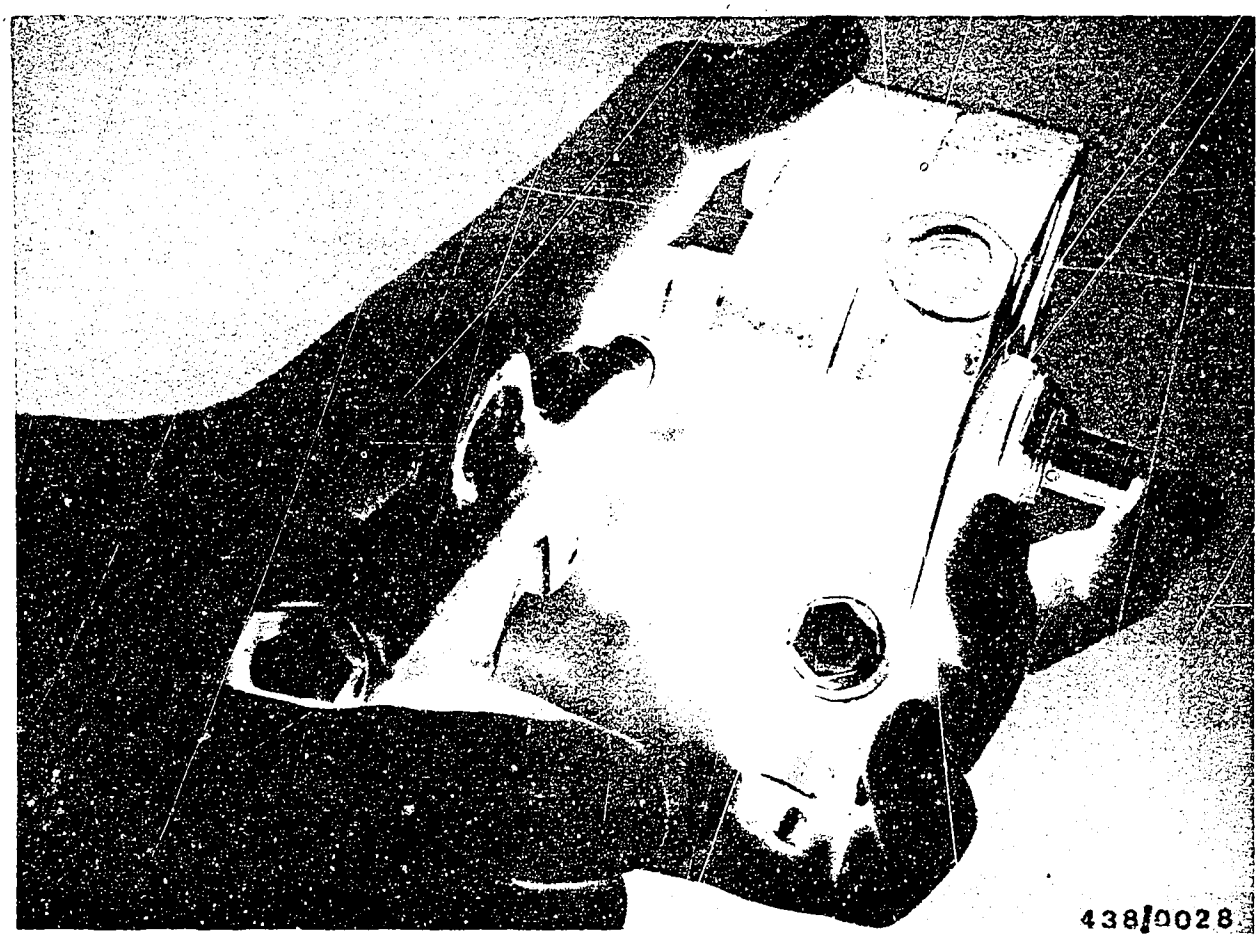
If the control plunger does not move freely, remove the fuel distributor from the air-flow sensor.

Important!
Note the following when installing fuel components and fuel lines:

Always ensure utmost cleanliness when loosening or tightening the fuel connections. No dirt must enter the fuel system.

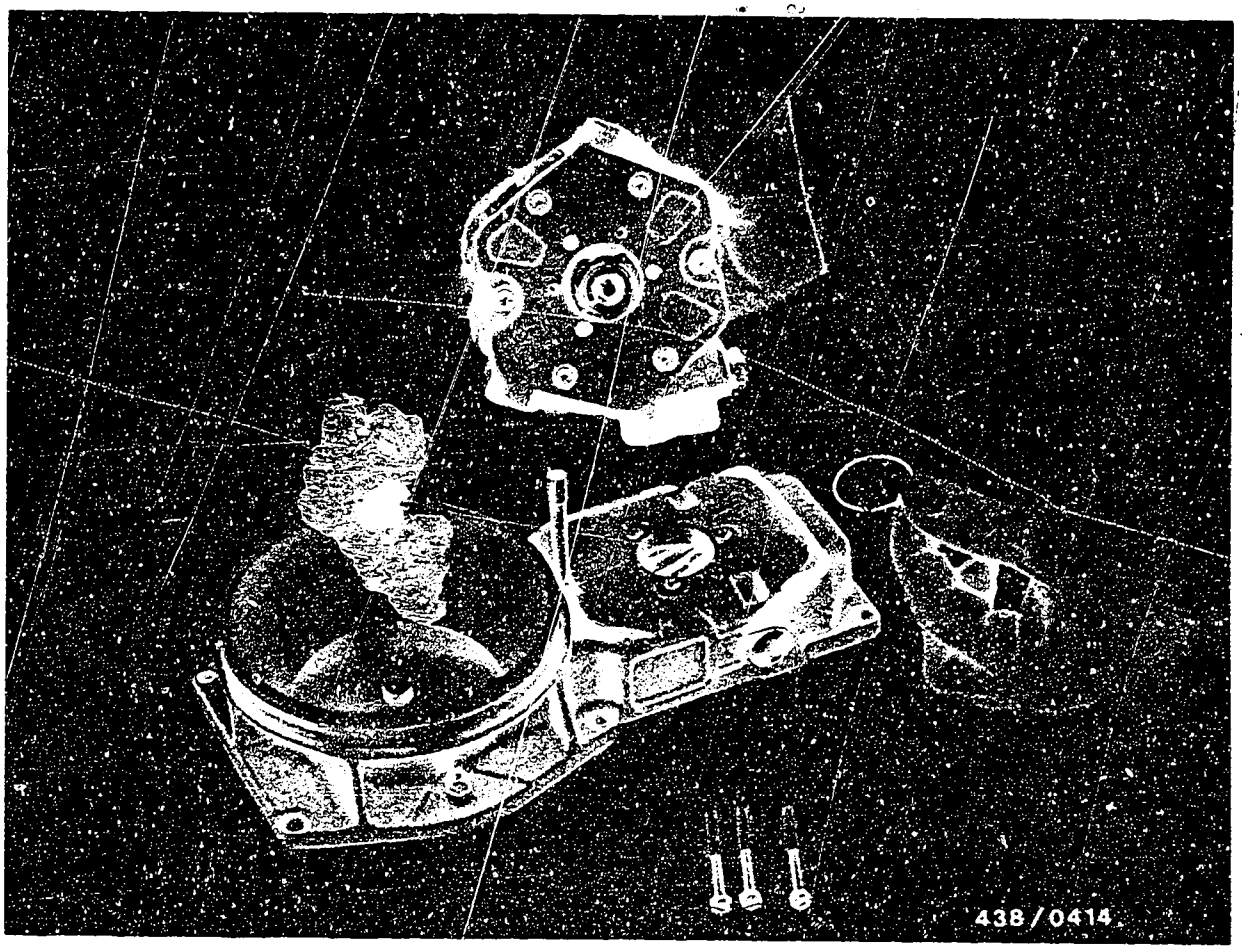
When loosening or tightening the fuel connections, apply counter-force at the fixed hexagon of the component.

Clean the fuel distributor thoroughly in the region of the fuel connections. Screw off all connections.



Unscrew the three fastening screws and remove the fuel distributor from the air-flow sensor.

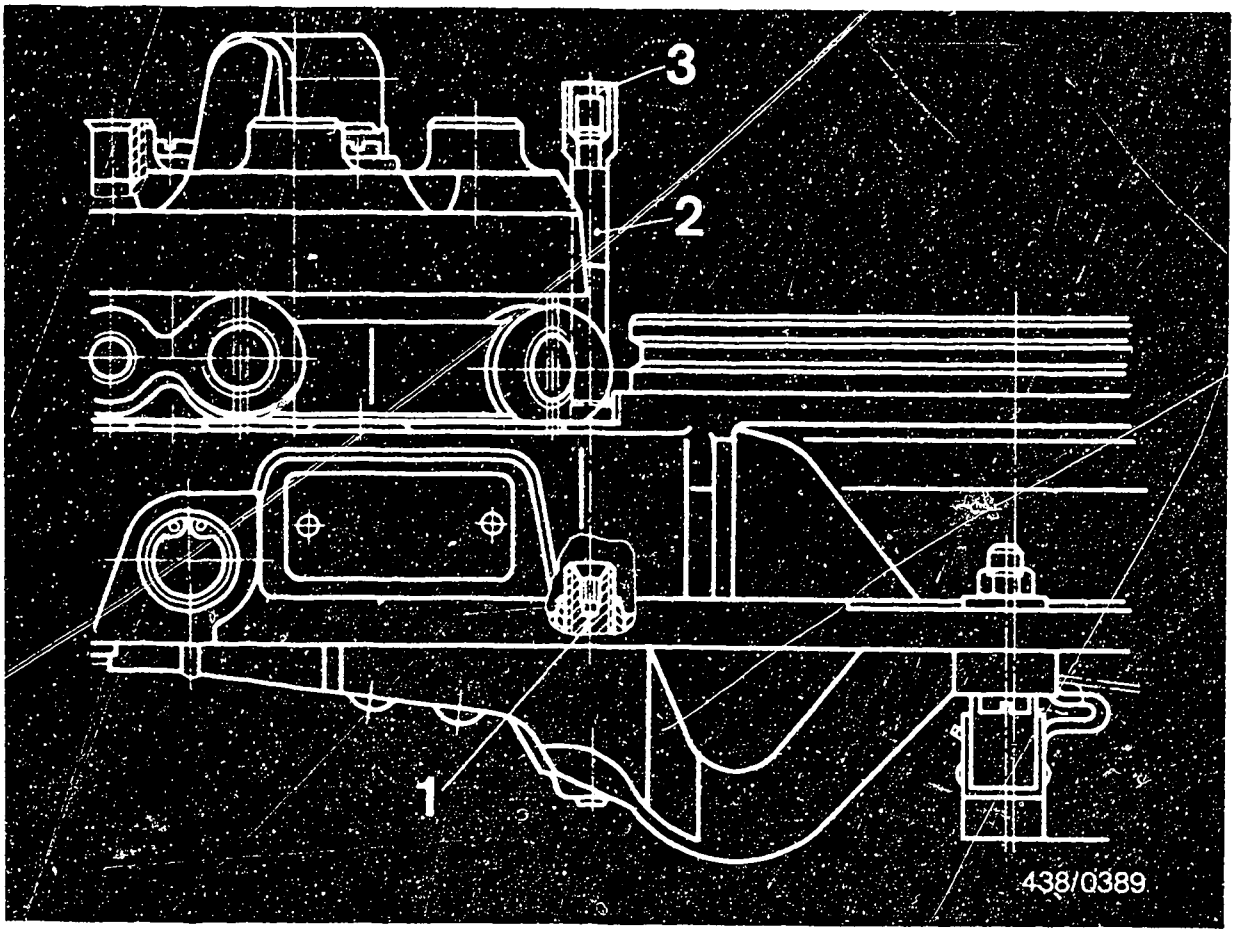
Remove the plunger. Under certain conditions, in order to do this it may be necessary to blow compressed air briefly against the plunger through the control-pressure connecting hole. Hold the plunger with your hand while doing this. Clean the plunger thoroughly with benzine. If the plunger still does not move freely, replace the fuel distributor.



9.4 Fitting the fuel distributor

When fitting the fuel distributor, use a new seal ring between fuel distributor and air-flow sensor. Observe the tightening torque 3.2...3.8 Nm (0.32... 0.38 kgfm) for the fastening screws precisely.

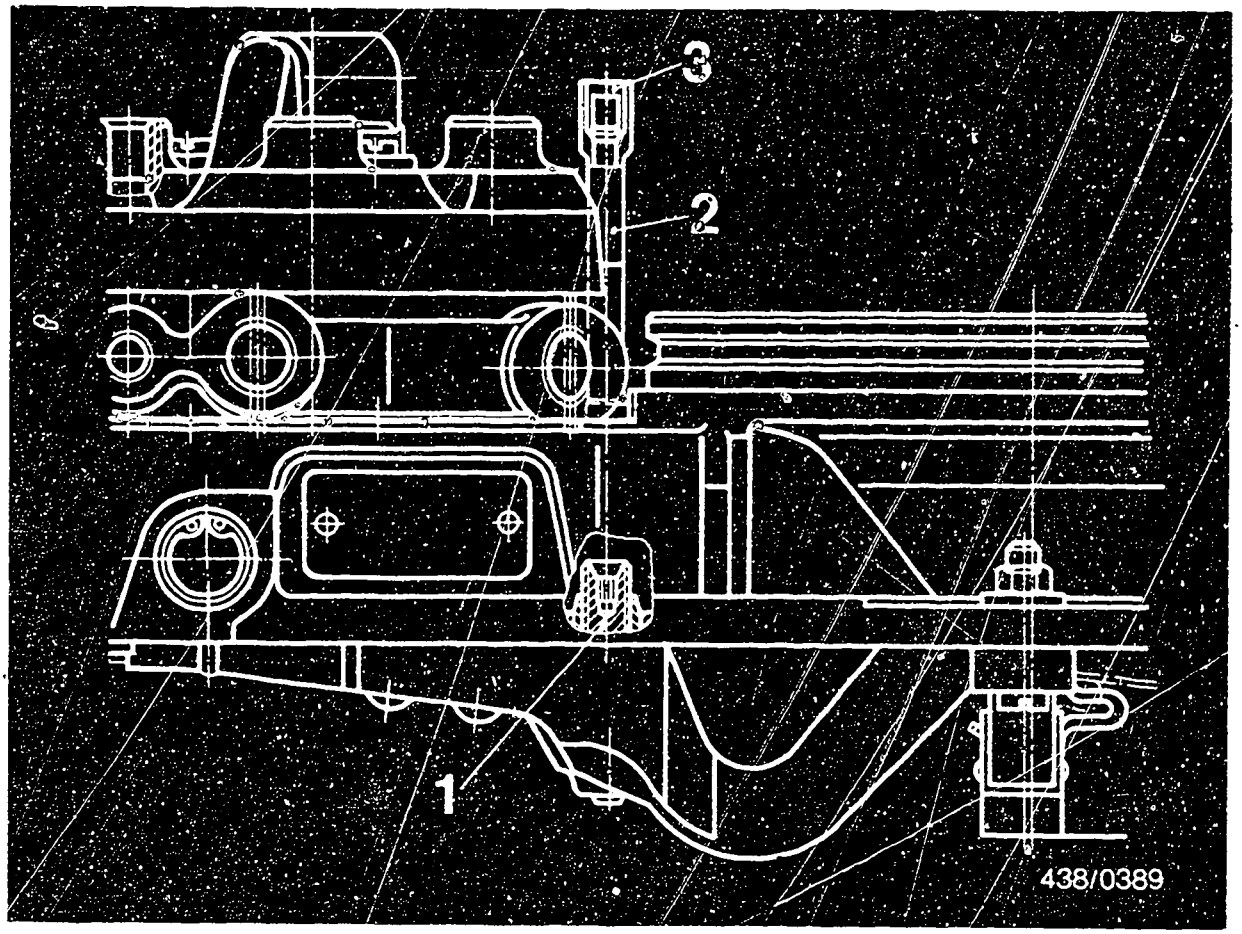
When connecting the fuel-injection tubing, use new seal rings.



1 = Idle-mixture-adjusting screw
2 = Guide tube
3 = Lead seal

9.5 Matching the fuel distributor to the air-flow sensor for initial starting

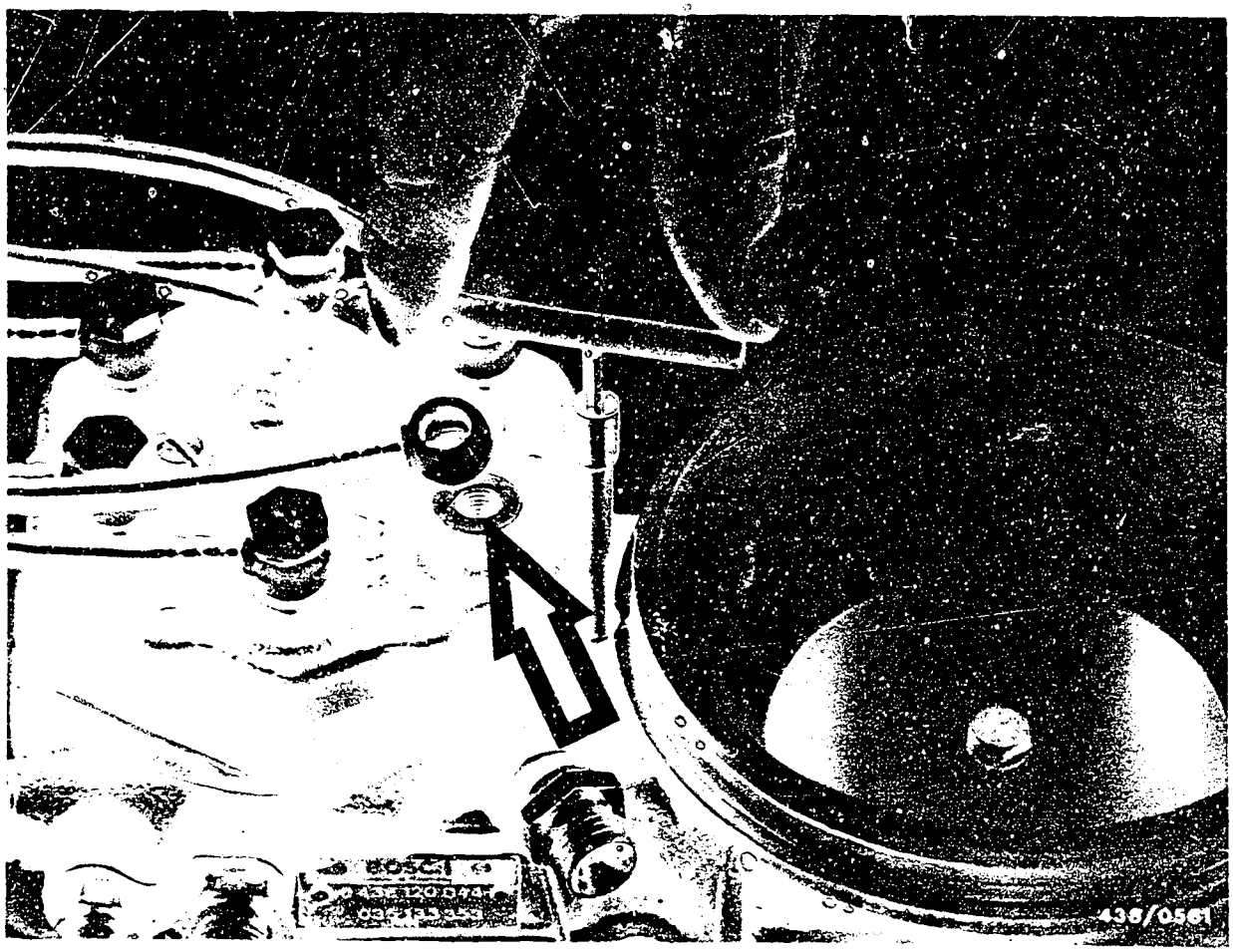
Screw off one fuel-injection line from the fuel distributor.
Bridge the electrical safety circuit so that the electric fuel pump operates.



1 = Idle-mixture-adjusting screw
2 = Guide tube
3 = Lead seal

The idle-mixture-adjusting screw is adjusted via a guide tube rigidly fitted on the mixture-control unit.

Remove anti-tamper device (lead seal) of the idle-mixture-adjusting screw. Introduce adjusting wrench KDEP 1035 through the hole until it locks in position in the idle-mixture-adjusting screw.

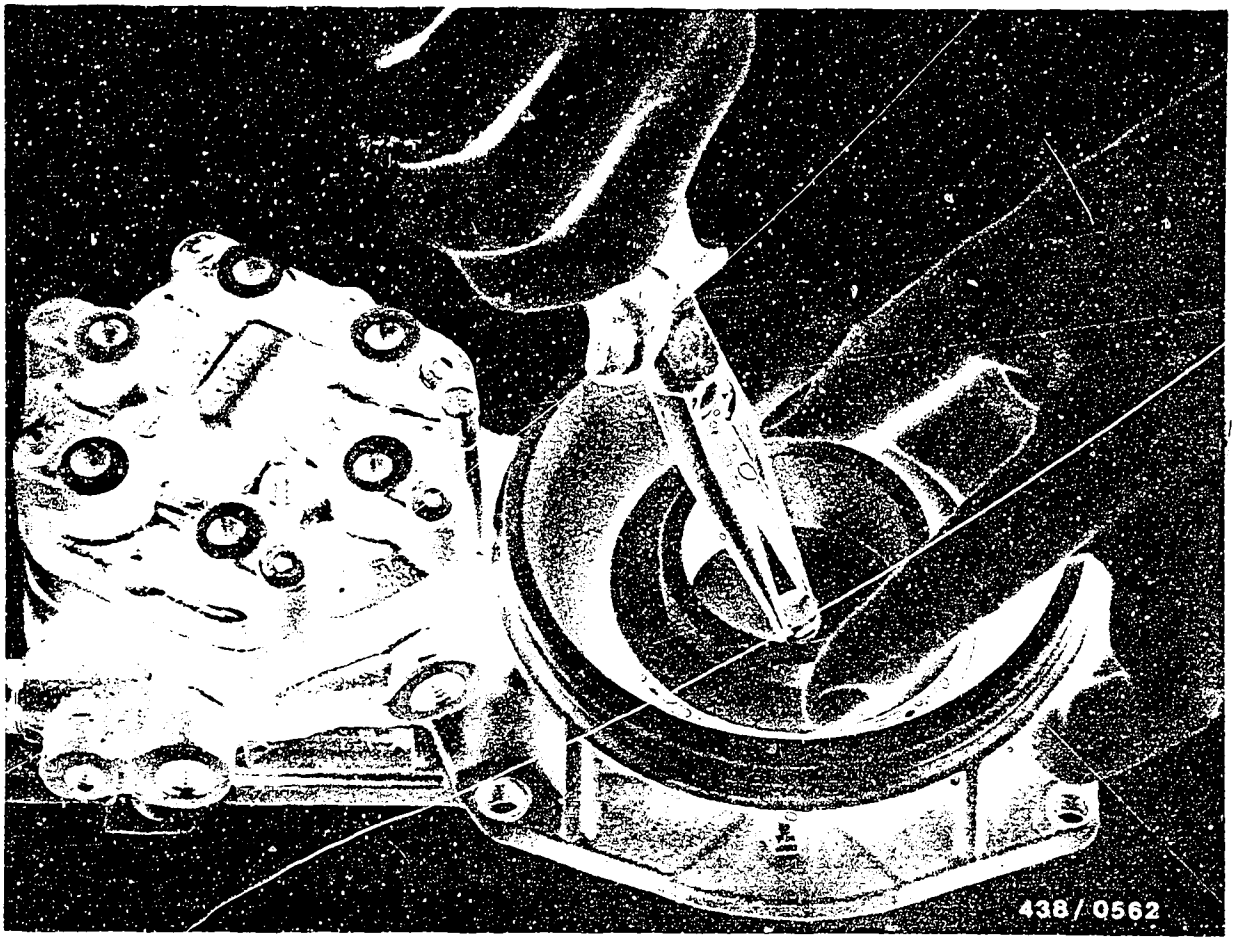


Screw in the idle-mixture-adjusting screw slowly and without exerting any great pressure on the adjusting wrench until fuel is just delivered from the open outlet (arrow) of the fuel distributor. Then turn back the adjusting screw by 1/2 turn.

Re-connect the fuel-injection line to the fuel distributor, start the engine and warm up.

The final matching of air-flow sensor and fuel distributor is carried out by adjusting the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates G4.



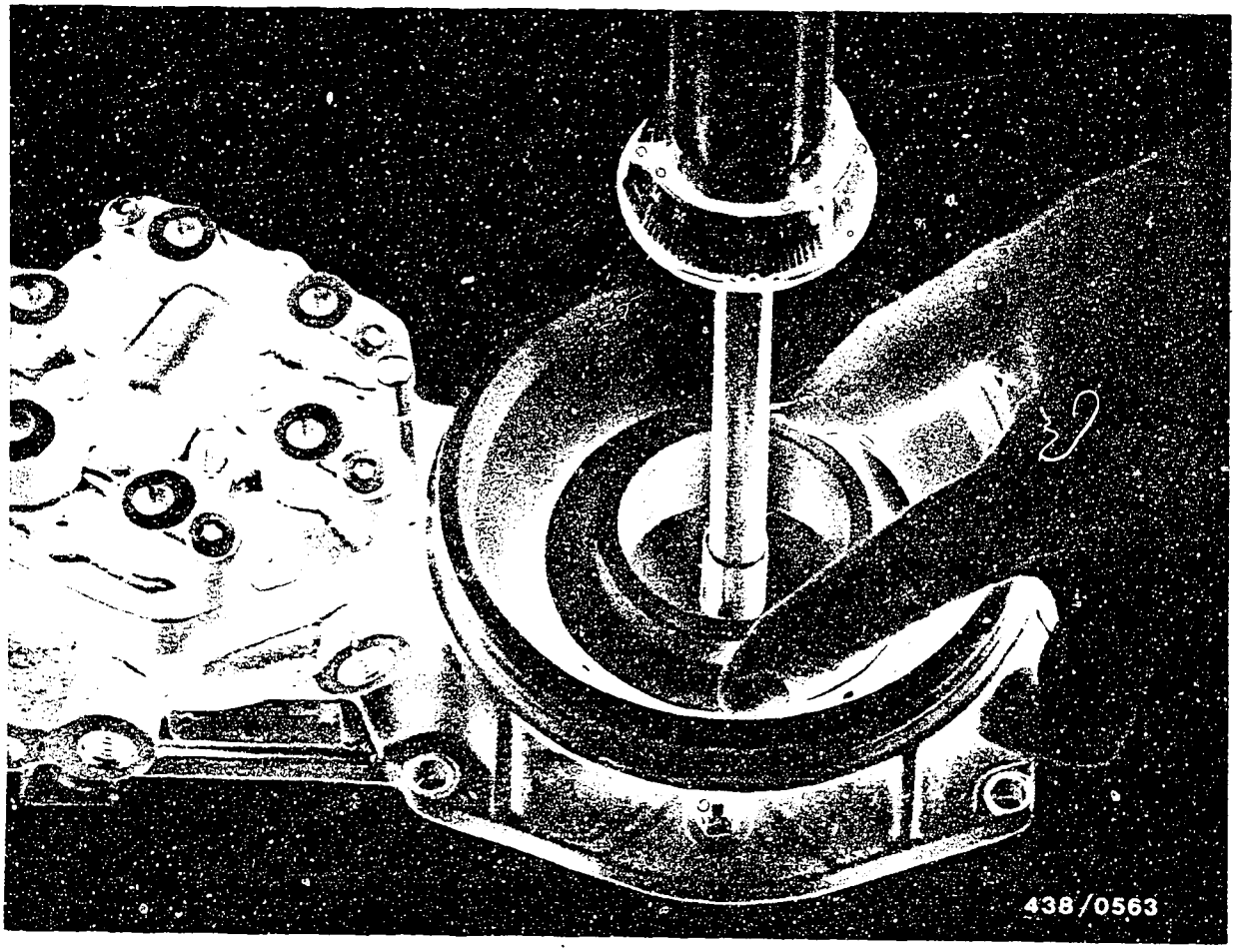
10. Checking and adjusting the position of the air-flow sensor plate

10.1 Preparations

- Engine temperature is not important.
- Remove the rubber hood from the air-flow sensor (release the clamping band) so that the air-flow sensor plate becomes accessible.

10.2 Centering the air-flow sensor plate

Check that the sensor plate is flat (not bent) and that it can move through the narrowest part of the air funnel without touching the funnel. If necessary, center it using a positioning ring KDEP 1040/10 (dia. 80 mm) as follows:



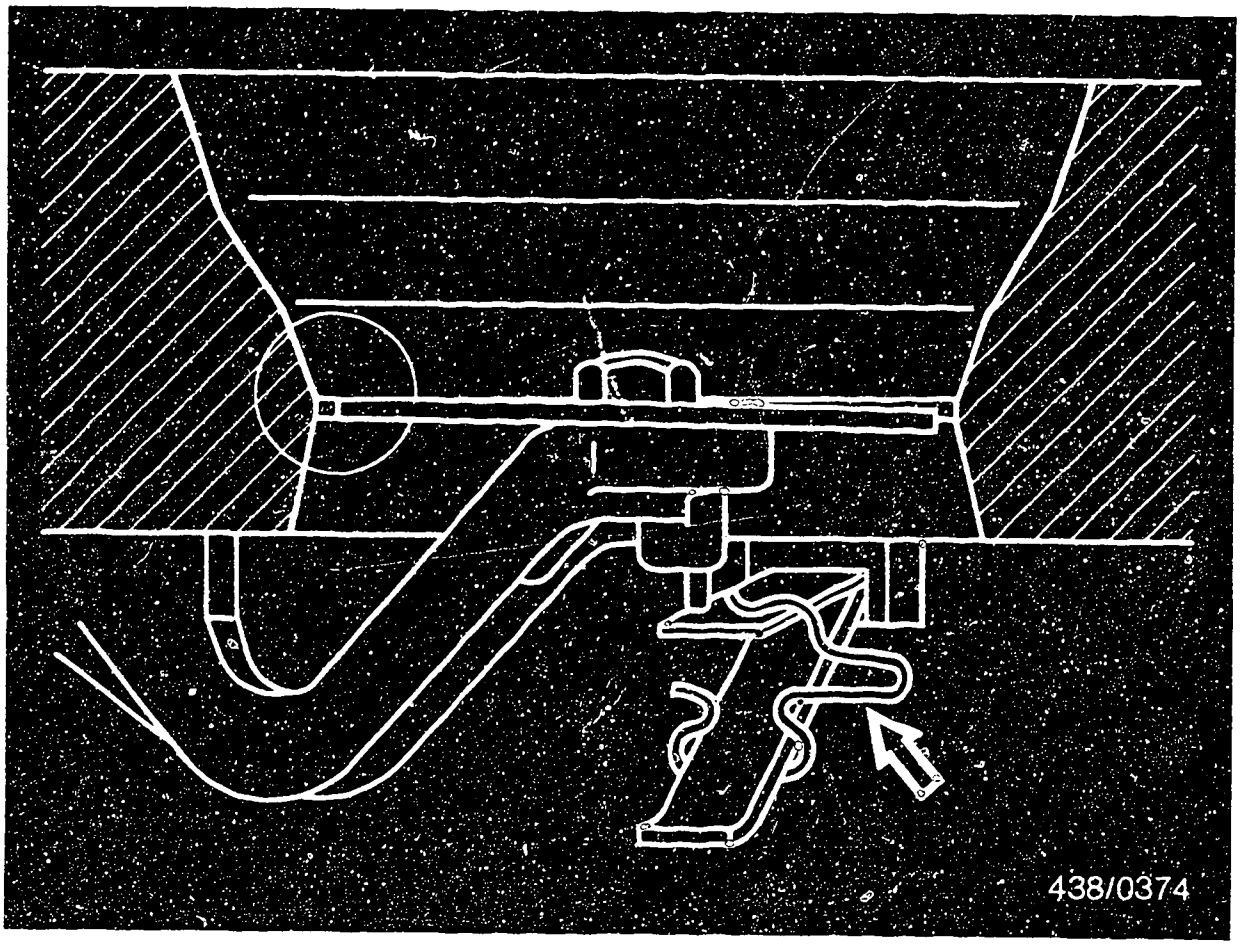
Loosen the sensor plate fastening screw. Insert the positioning ring while holding the fastening screws with pliers so that the sensor plate does not deflect downwards.

With the positioning ring in place, tighten the fastening screw with a torque of 5.0...5.5 Nm, loosen again and tighten again with the same torque.
When tightening the screw make sure that the air-flow sensor plate is in its zero position (in the cylindrical part of the air funnel).

It must no longer be possible to turn the air-flow sensor plate by hand.

Caution:

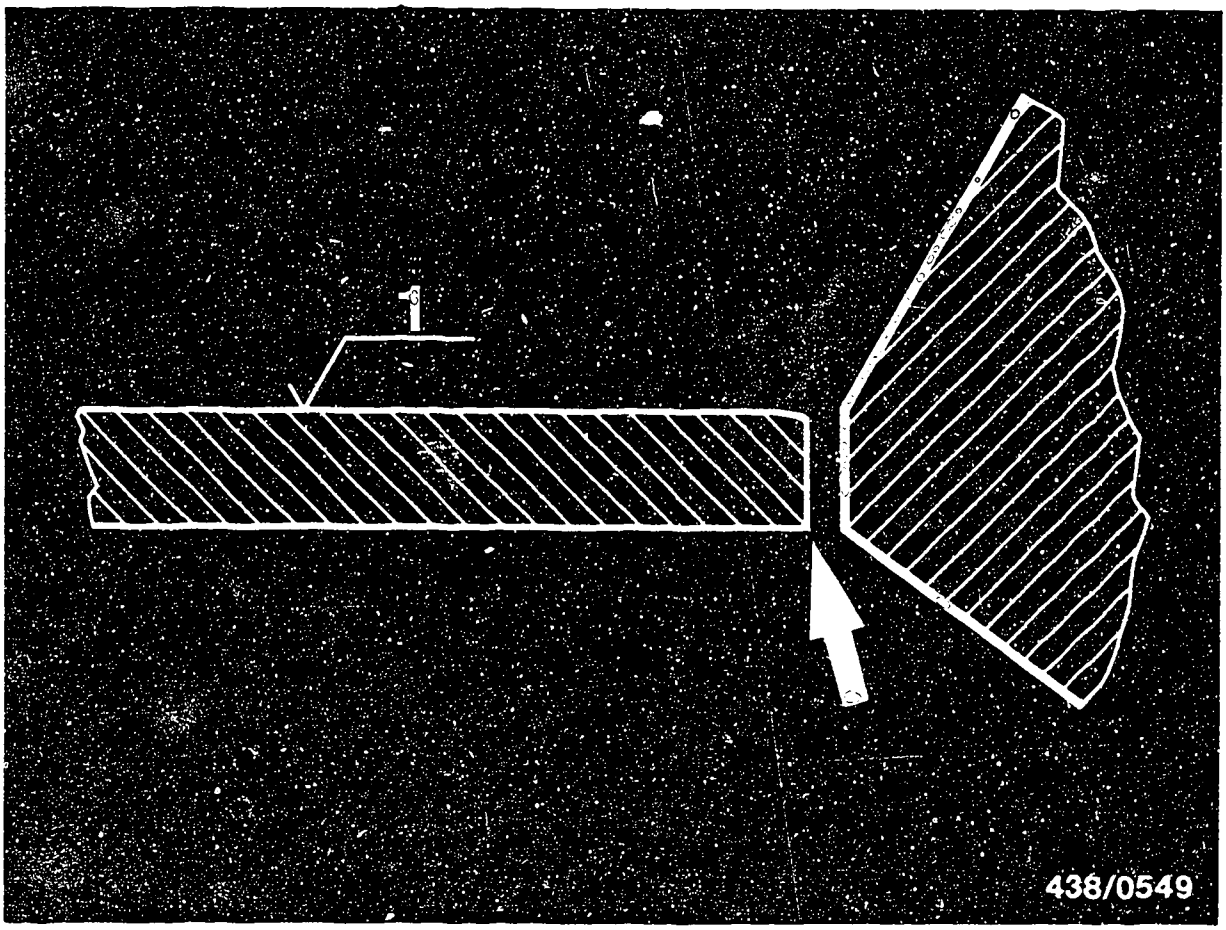
The lower edge of the sensor plate is partially chamfered. In order to ensure that sensor plate is correctly mounted, its upper side is identified by five punch marks in a row.



10.3 Checking and adjusting the zero position of the sensor plate (rest position):

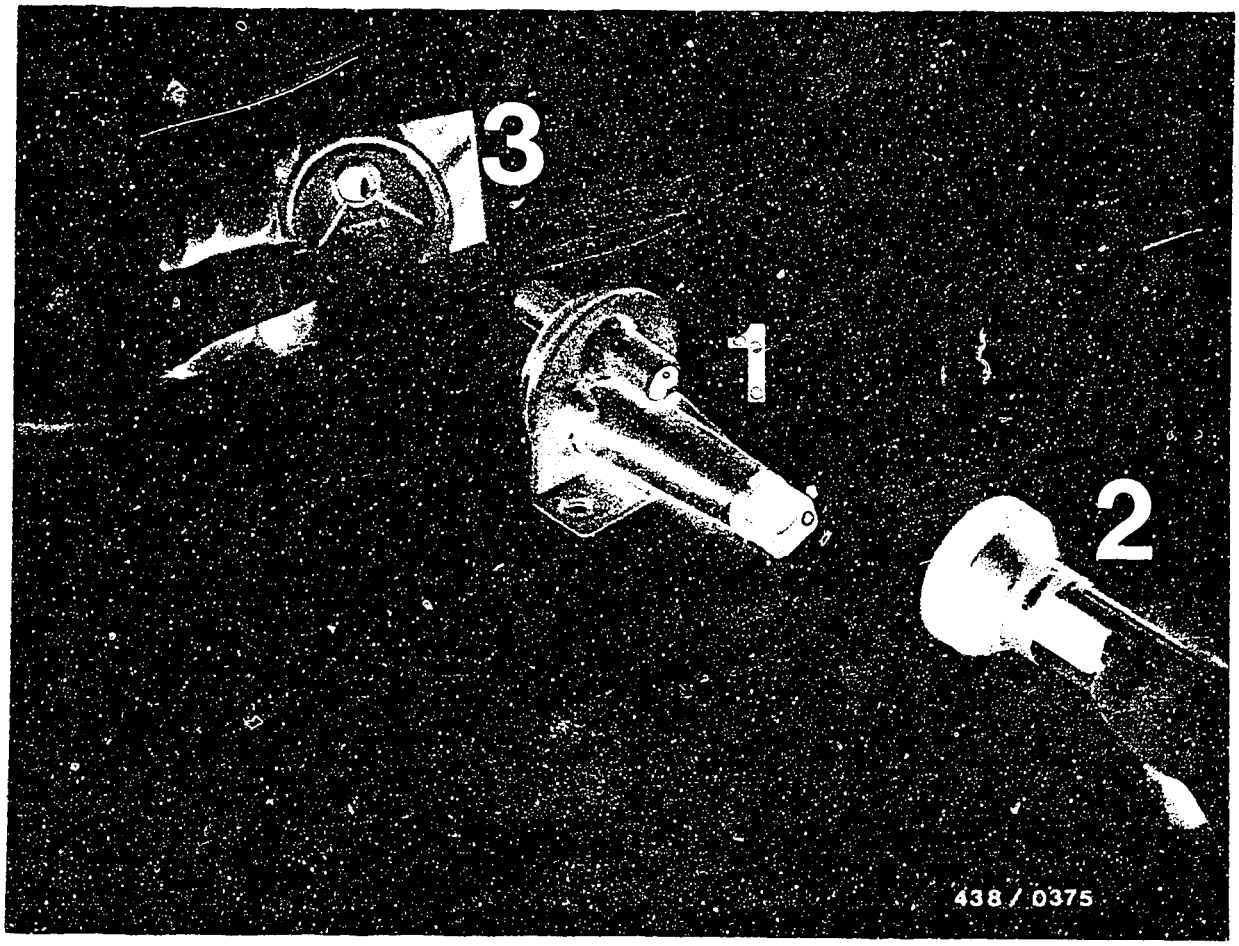
Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
This results in application of the control pressure to the control plunger in the fuel distributor.

The upper edge of the sensor plate must be flush with the beginning of the cone in the position shown in the picture. A lower position of up to maximum 0.5 mm is permissible, however the air-flow sensor plate must not project at any point on its circumference outside the cylindrical part of the air funnel.
If necessary, the position of the leaf-spring limit-stop can be corrected by adjusting the shaped spring (arrow).



1 = 5 centre punch marks

Caution:
Make sure that the air-flow sensor plate is correctly installed.
The top side of the plate is identified by five centre punch marks (in a line).
The sharp edge (arrow) of the air-flow sensor plate is at the bottom.



1 = Auxiliary-air device
2 = Flashlight
3 = Mirror

11. Checking the operation of the auyiliary-air device.

The engine must be cold.
Disconnect the electric cable plugs from the auxiliary-air device and warm-up regulator.
Disconnect both air hoses from the auxiliary-air device.
Since the two hose fittings on the auxiliary-air device are located exactly opposite each other, a visual check can now be made to see if the blocking plate is partially open.
It will be easier to look through the auxiliary-air device with the aid of a flashlight and a mirror, as shown in the illustration.

If, with the engine cold, there is no opening visible, replace the auxiliary-air device.

Plug the plug onto the auxiliary-air device.

By bridging the electrical safety circuit, supply the auxiliary-air device with power. After a maximum of 10 minutes the opening of the auxiliary-air device must be entirely closed by the blocking plate.

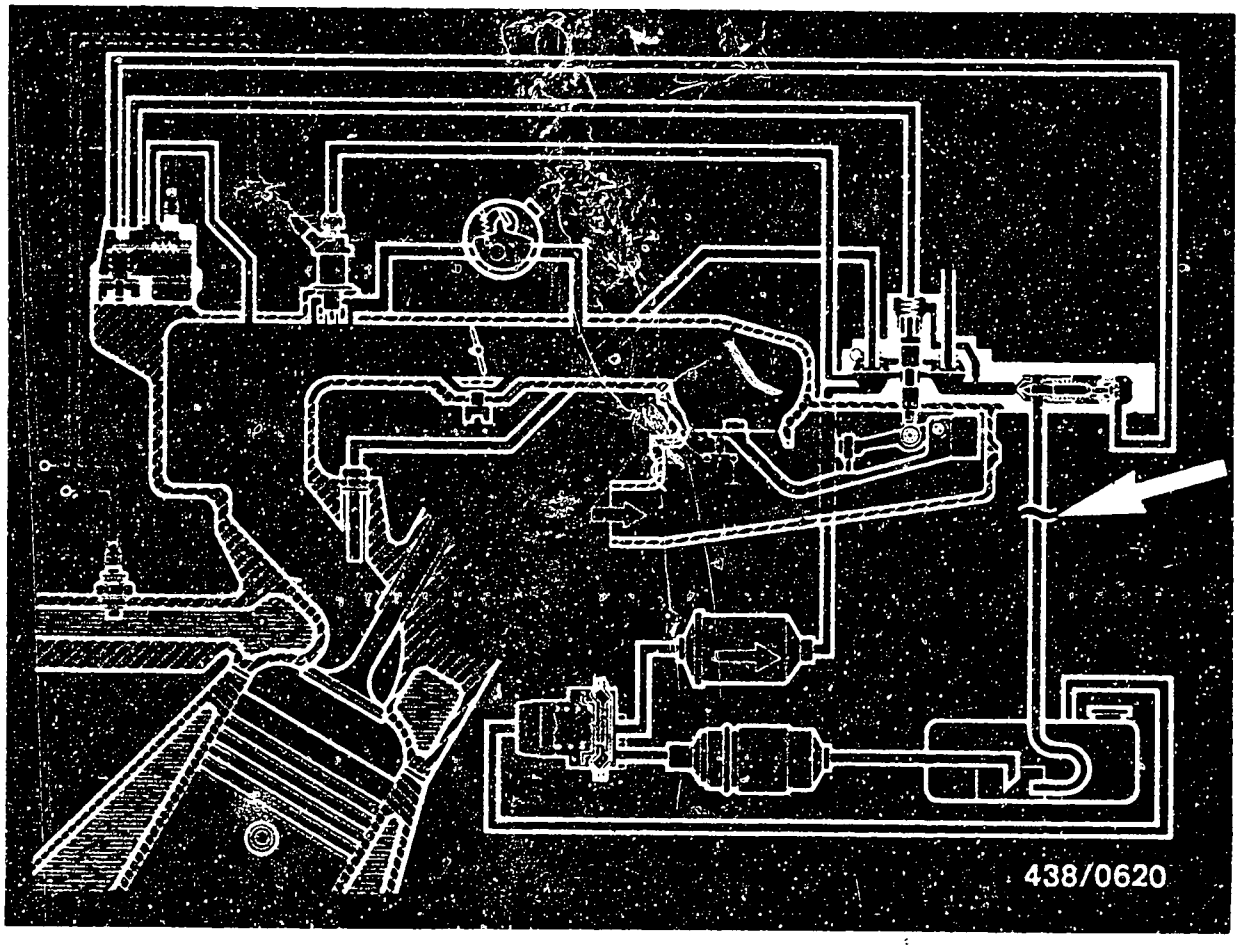
If the blocking plate does not close, check the power supply (open circuit, voltage drop). Minimum voltage across the connector 11.5 V with the engine stopped.

If these points are OK, check the heating coil of the auxiliary-air device for an open circuit with the ohmmeter.

Replace the auxiliary-air device if defective.

When the auxiliary-air device has been replaced, carry out the idle adjustment with the engine at normal operating temperature.

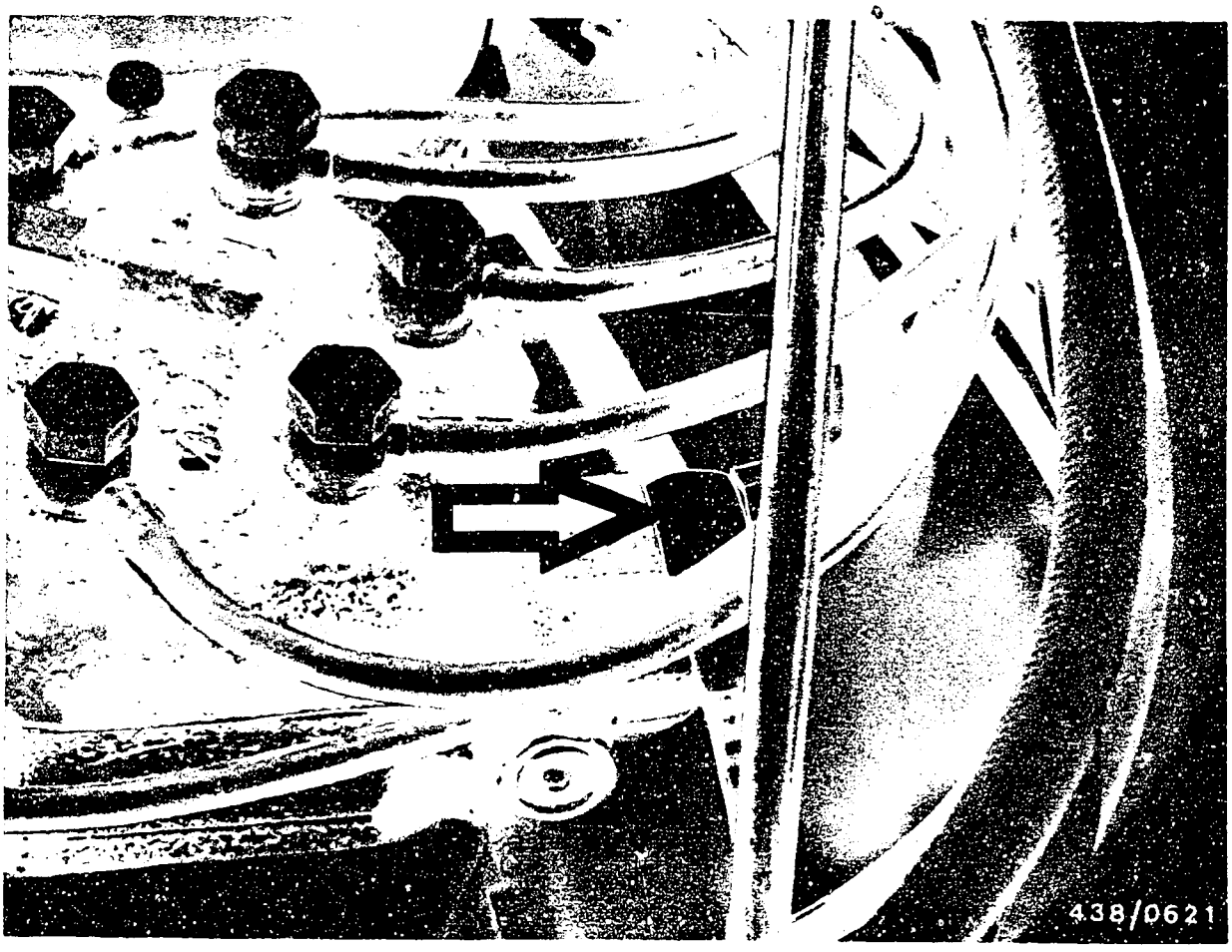
Idle adjustment is described on Coordinates G4.



12. Checking the operation of the electric fuel pump.

12.1 Requirement

Conclusive information on the operation of the electric fuel pump can only be given by a measurement of fuel delivery under pressure, i.e. under primary (system) pressure. This measurement must therefore be made at the return line leading to the fuel tank (arrow).



12.2 Measuring point

A suitable measuring point for fuel-delivery testing is the return port (arrow) on the fuel distributor.
Unscrew the fuel return line from the fuel distributor.
Equip a test hose with an inlet union (diameter 12 mm) and connect to the return port of the fuel distributor.

Hold the end of the hose in a graduate (approx. 1.5 litres capacity) in order to make the measurement.

12.3 Checking:

Pull off the plug from the warm-up regulator and auxiliary-air device.

Switch on the electric fuel pump for 30 seconds by bridging the safety circuit and collect the fuel delivered in a graduate.

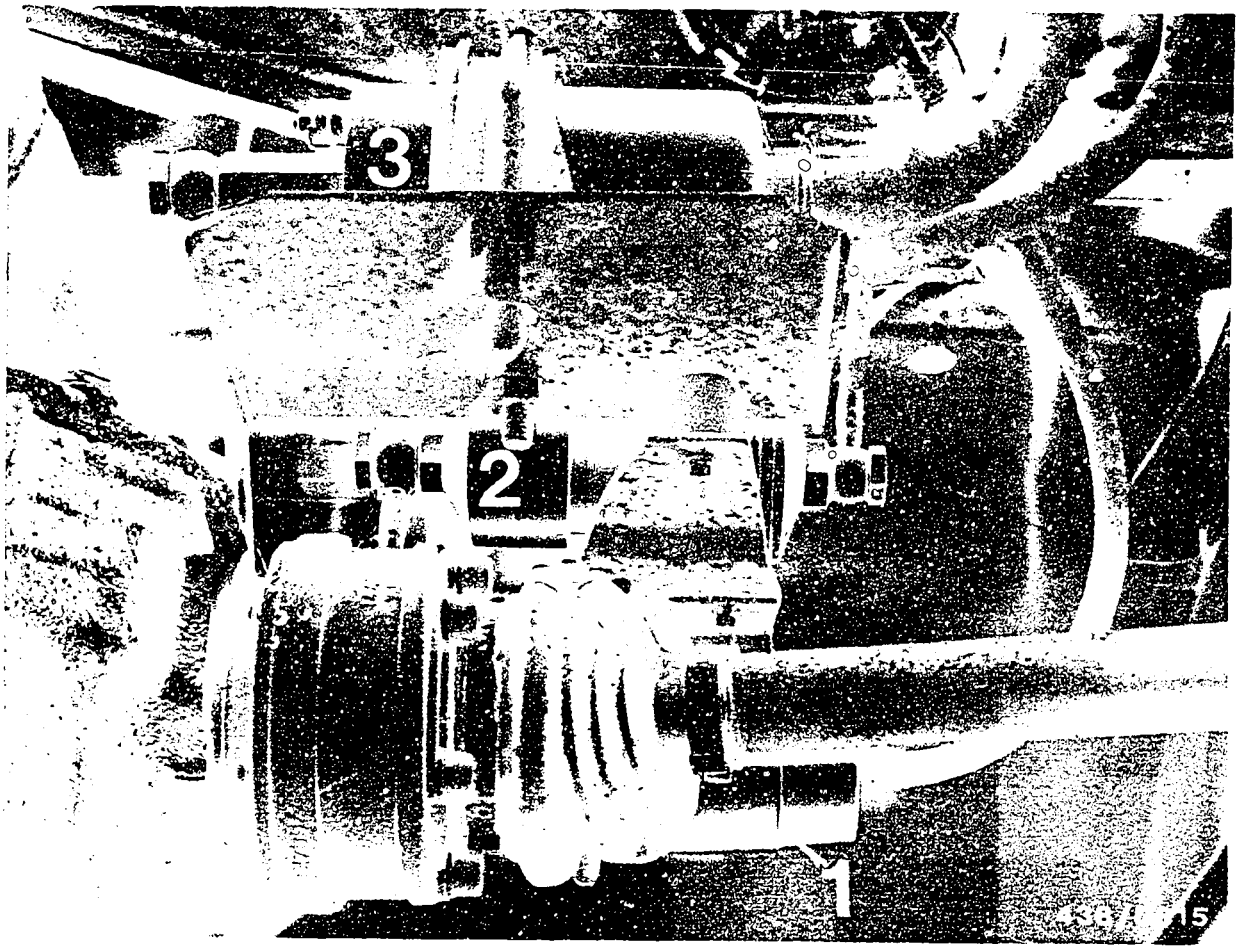
12.4 Test specification:

Fuel delivery: at least 930 cm^3/30 seconds.

12.5 Possible causes of insufficient fuel delivery:

- Power supply to the electric fuel pump defective, voltage drop. Minimum voltage at terminal with pump operating = 11.5 V.
- Fuel filter very dirty.
- Primary pressure too high.

If these items are OK, the fault lies in the electric fuel pump itself.
Replace the electric fuel pump.



1 = Fuel accumulator
2 = Fuel filter
3 = Electric fuel pump

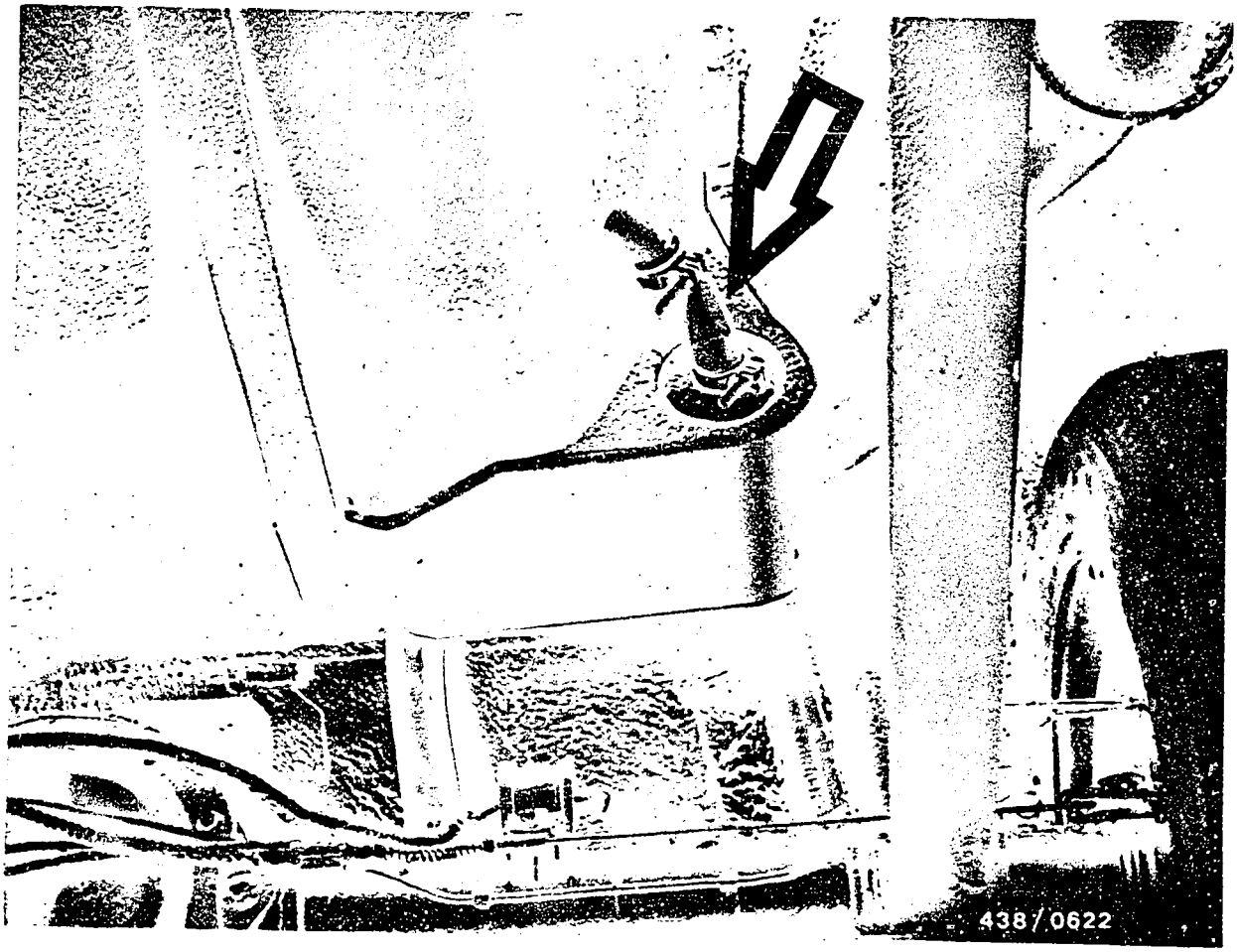
12.6 Removing and installing the electric fuel pump and the fuel filter on the Granada model:

Both components (2 and 3) can be removed separately from the mounting piece. Due to the large amount of dirt accumulating at the place where these components are installed, thoroughly clean all connections before loosening.
Before removing the electric fuel pump (3) pinch off the intake hose (e.g. using hose clamper W 157 from the Matra Co.).

Unscrew the inlet-union screws of the connection lines, collecting any escaping fuel.

Loosen the clamping bracket and remove the component from the side.

When installing, always use new seal rings for the fuel connections. Ensure proper routing and fastening of the electric connections for the electric fuel pump.



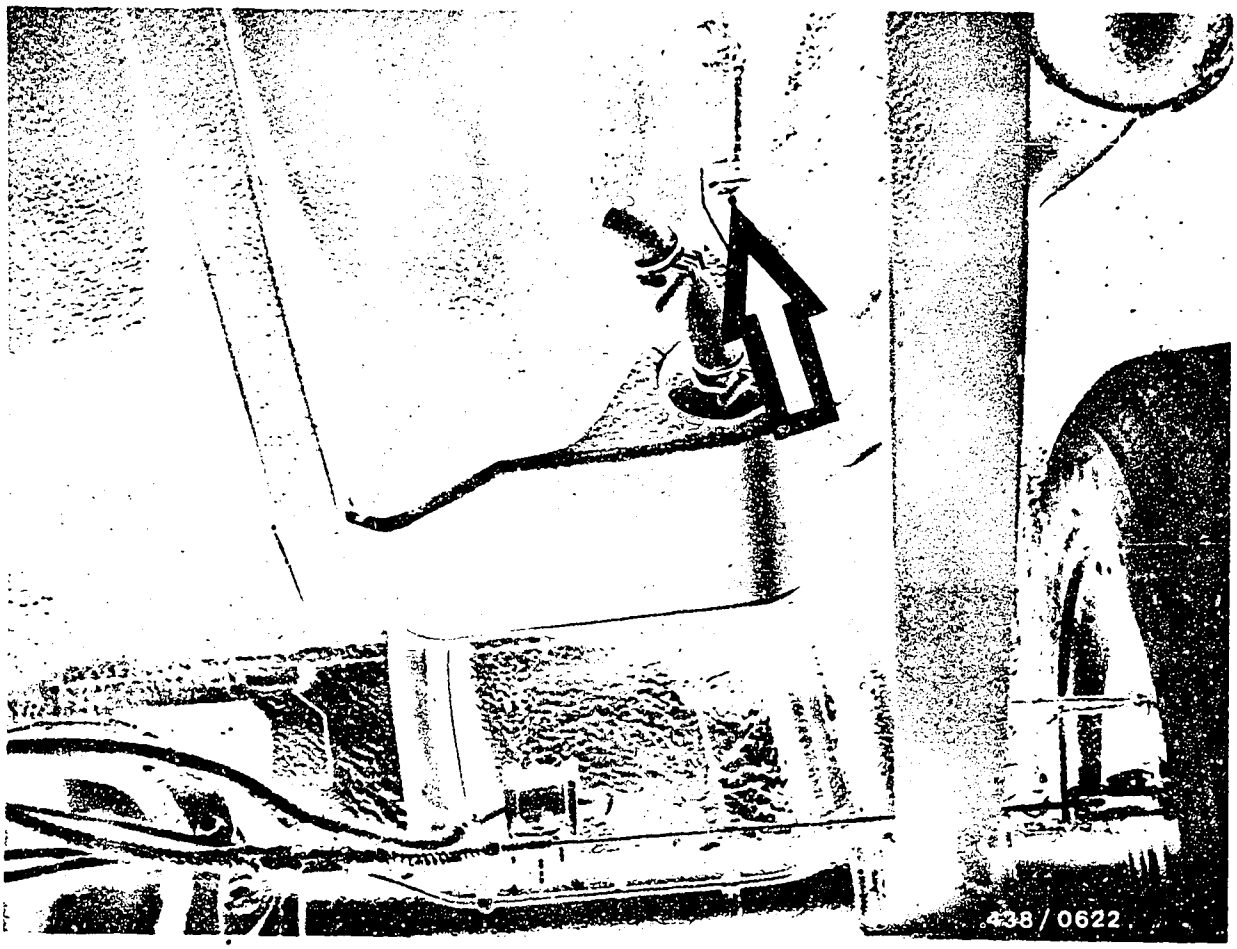
12.7 Removing and installing the electric fuel pump on the Capri model:

Pinch off the intake hose before loosening (e.g. using hose clamper W 157 from the Matra Co.) in order to prevent the escape of fuel.

Loosen the hose clip and remove the intake hose from the fitting on the electric fuel pump.

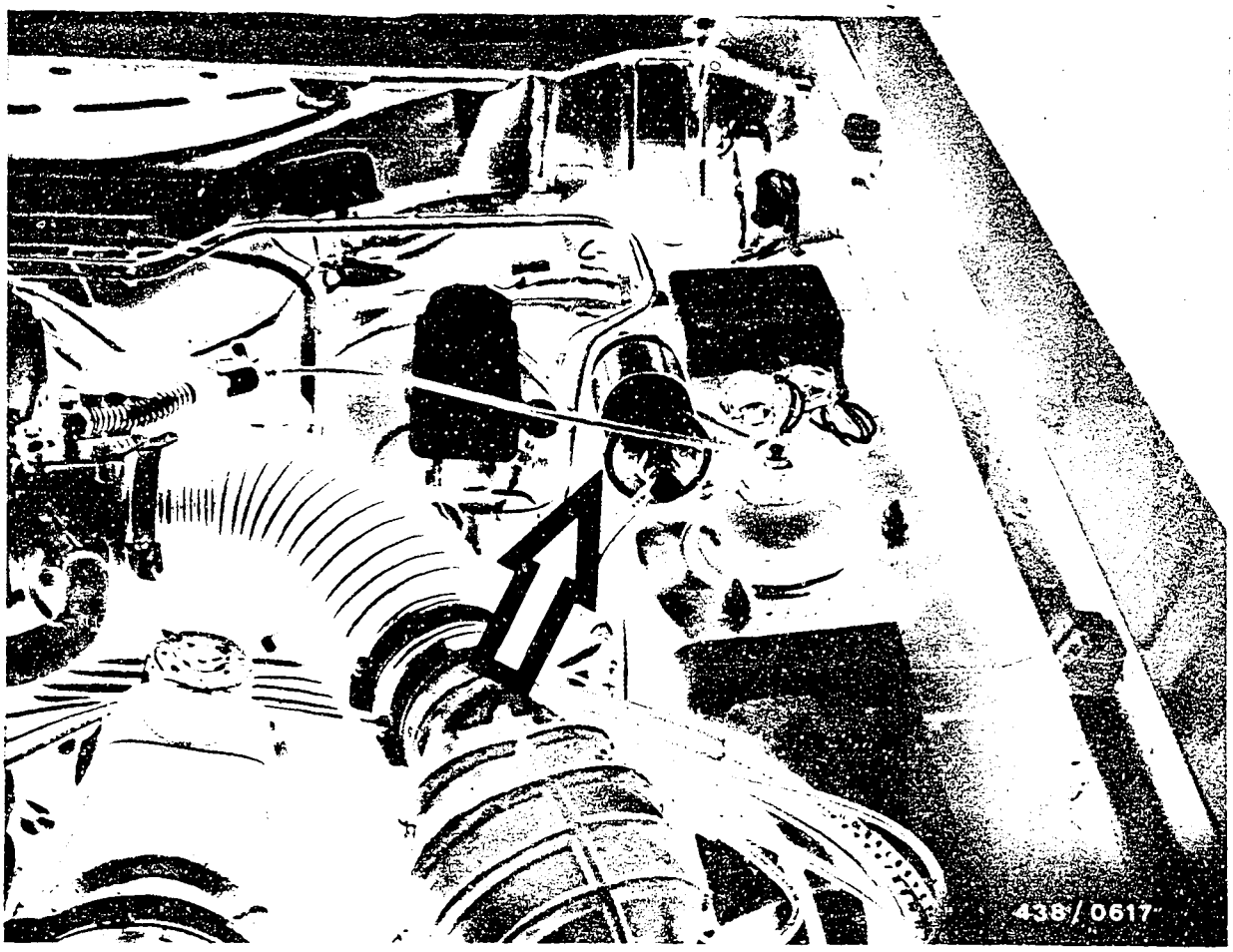
Screw off the delivery line.

Remove the complete bracket of the electric fuel pump.



To do this, remove the two upper fastening screws (one screw visible in the picture, arrow) and the complete bracket on the side of the clamping band of the fuel tank. Remove the electric fuel pump from the bracket.

Install in the reverse order. Connect the delivery line with new seal rings.

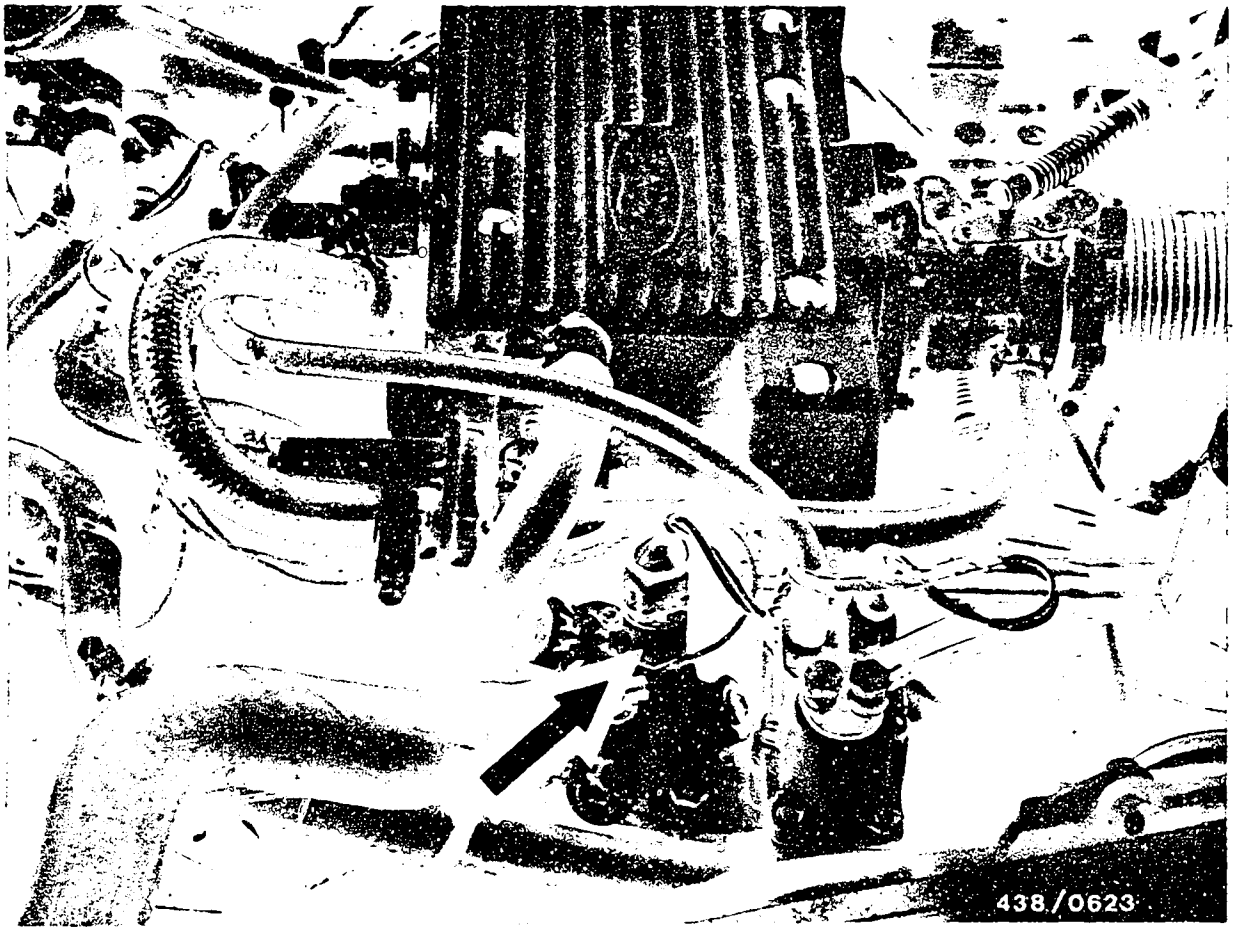


12.8 Removing and installing the fuel filter on the Capri model:

Unscrew the fuel lines.

Loosen the fastening clamp and remove the filter.

When installing the filter, use new seal rings for the fuel connections.

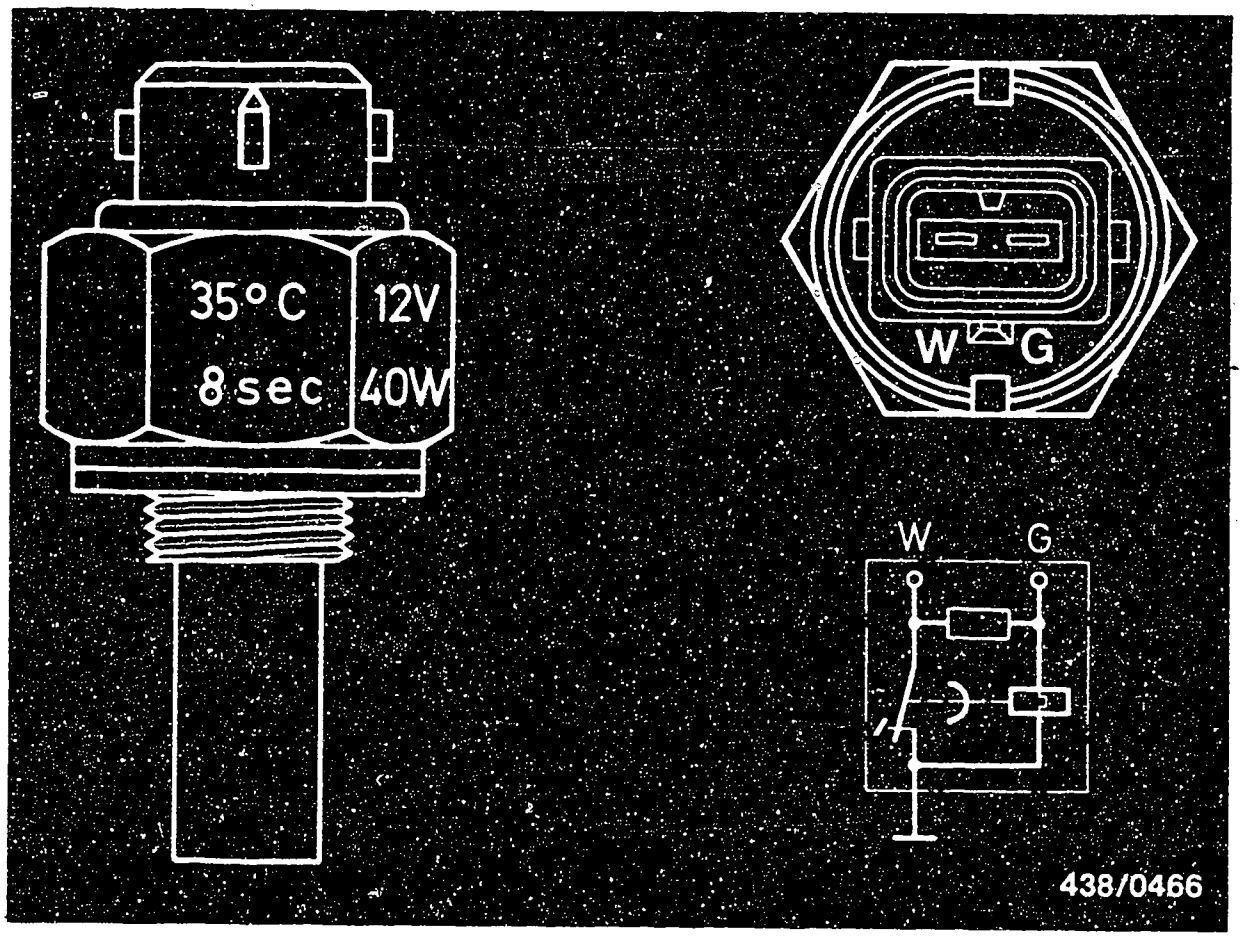


13. Checking the cold-starting system (thermo-time switch, start valve).

13.1 Thermo-time switch:

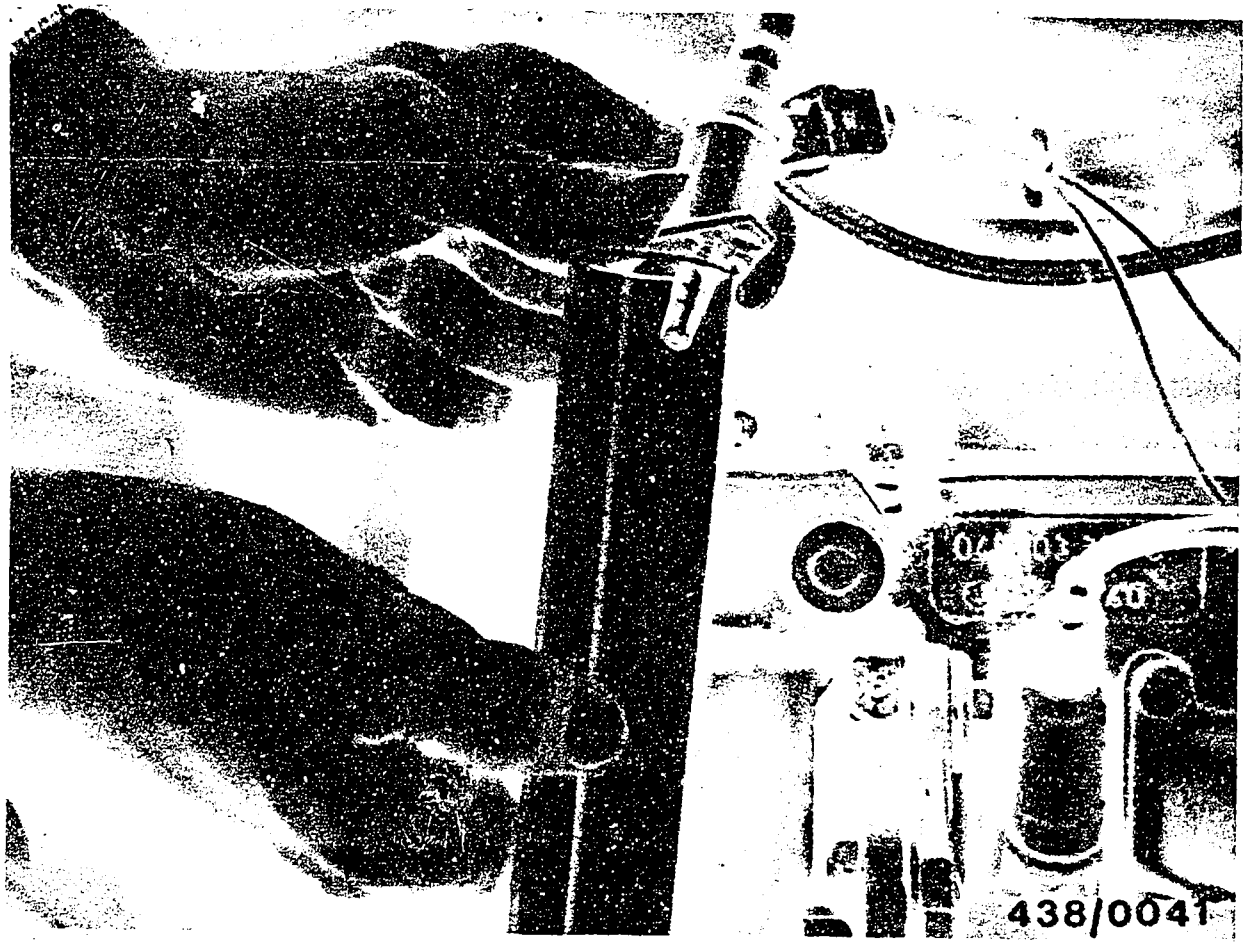
Remove the thermo-time switch for testing. It is screwed into the coolant fitting on the front end of the engine.

Note:
If possible, remove only with the engine cold since a slight amount of coolant will escape. The quantity escaping would be considerably greater if the engine were warm.



The switching temperature +35°C and the switching time at -20°C of 8 seconds are stamped into the hexagonal section of the thermo-time switch.
The removed thermo-time switch is tested using the ohm-meter in accordance with the specificaions given below. The temperatures for the thermo-time switch can easily be obtained with water. Cooling takes place in a freezer chest.

		Resistance measurement (Ω) between		
At a temperature below °C	above °C	Term. "G" and "ground" (housing)	Term. "W" and "ground" (housing)	Term. "G" and Term. "W"
+30		25...40	0	25...40
	+40	50...80	100...160	50...80



13.2 Start valve

Remove the start valve, hose line remains connected.
Pull off the plug and connect the start valve directly to ground and to terminal 15 (e.g. at the ignition coil) using connecting cable KDJE 7450/70.
Important note:
During this test, do not let the connecting cable touch B +. Danger of fire due to sparking!
Hold the start valve in a suitable container (e.g. the graduate).
Switch on the electric fuel pump by bridging the safety circuit.
Switch on the ignition (max. 30 seconds). The start valve must now open and spray fuel.

Switch off the ignition, remove the electric connecting cable and dry the nozzle of the start valve.
The safety circuit remains bridged so that the primary pressure is applied to the start valve.
No droplets of fuel must drip from the nozzle of the start valve during the next minute. Even if shaken and knocked, the start valve must not leak.
Then switch the electric fuel pump off again.
Replace the start valve if it does not open or if it leaks.

If a leaky start valve or a defective thermo-time switch has been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.
Idle-speed adjustment is described on Coordinates G4.

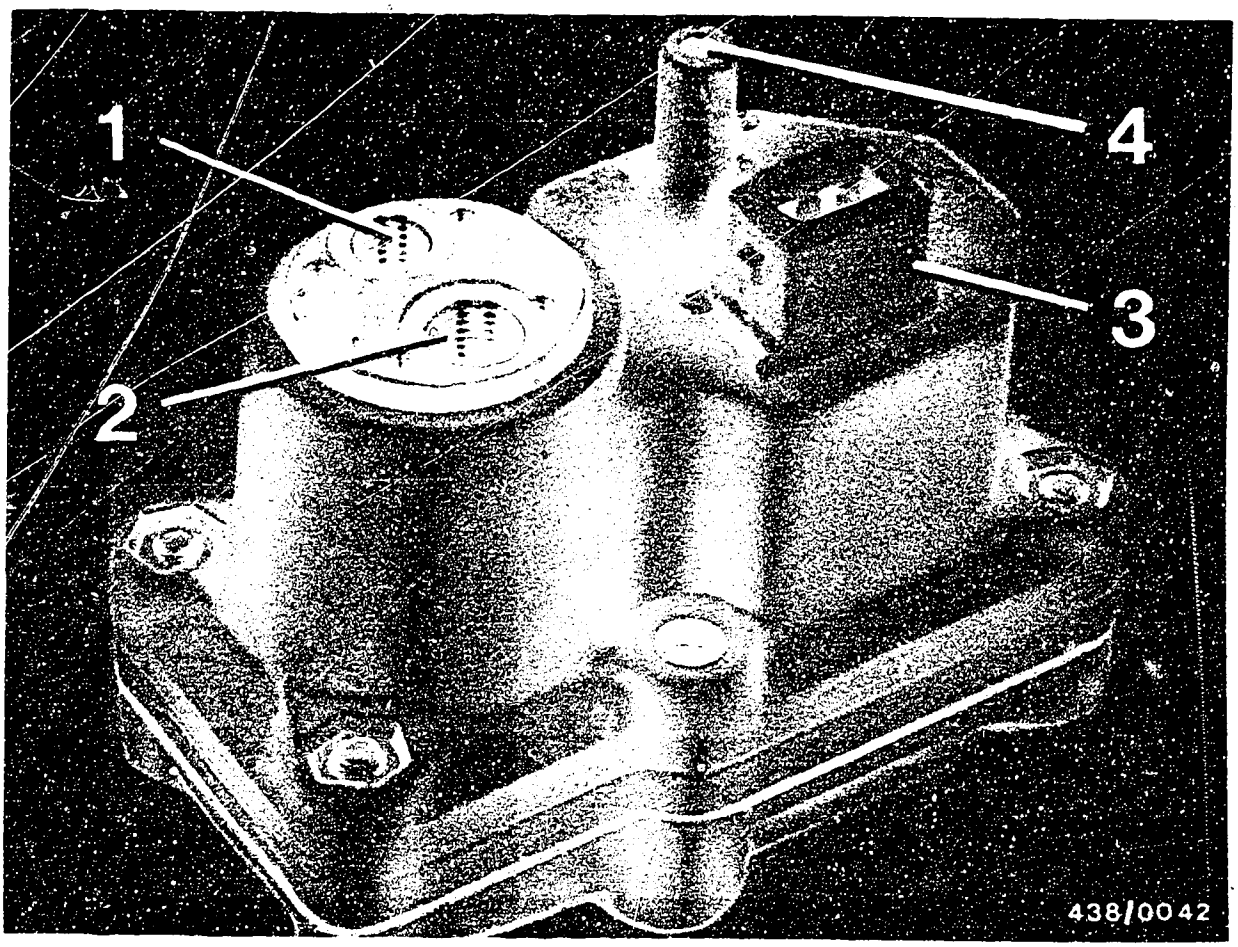
14. Checking the control pressures

14.1 Preliminary remarks:

The control pressures tested in the following are in each case governed by the warm-up regulator.
If the test results are incorrect, however, this may also be due to faults which have nothing to do with the warm-up regulator.

These possible faults are:

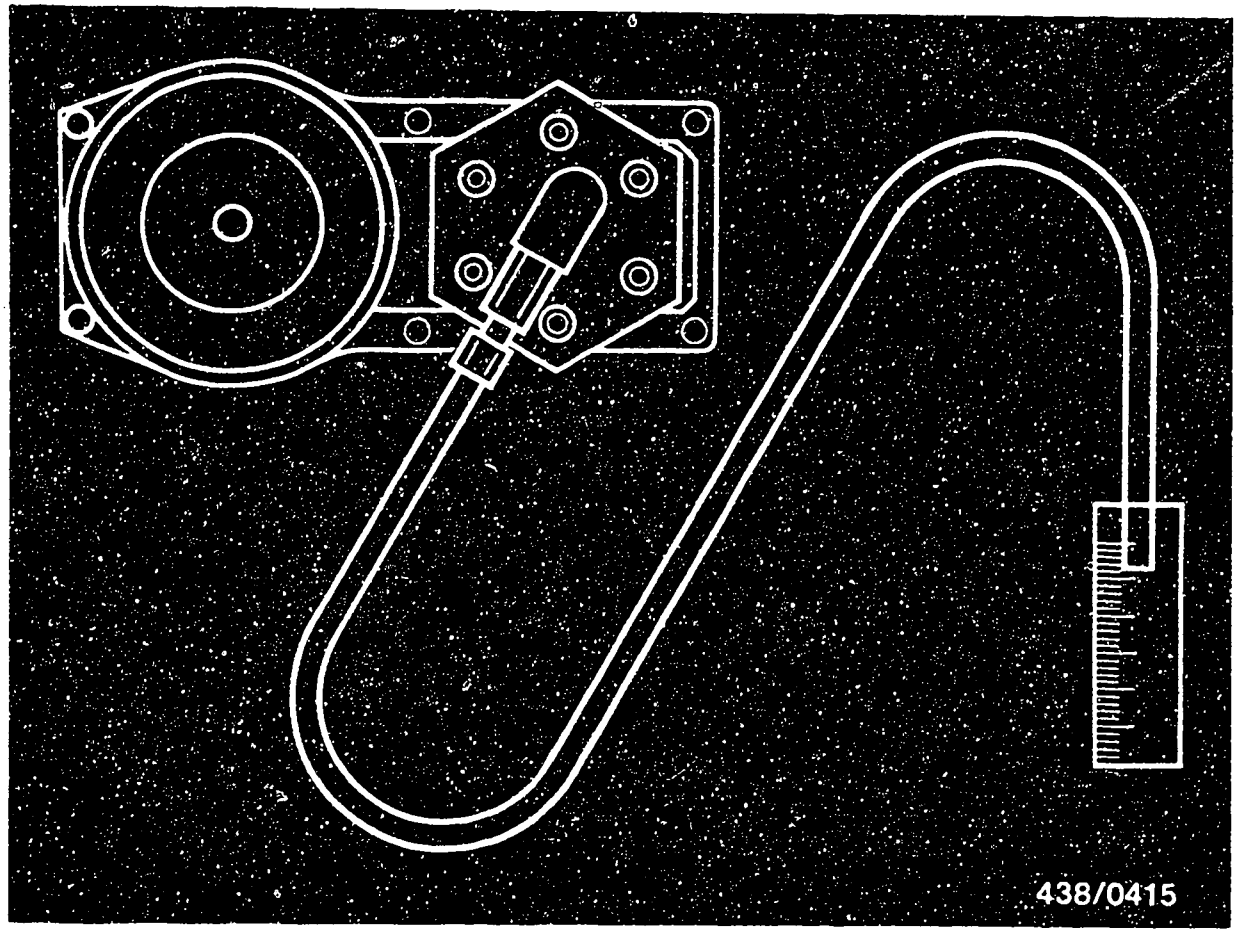
- No or too low a voltage at the electric connector.
- Fuel return from the warm-up regulator blocked or constricted.
- Too high a fuel delivery for the control-pressure circuit.
  The testing of this control-pressure delivery is described as an additional test step at the beginning of the control pressure tests.
  Test specification: 160...240 cm^3/min.
  Reference is made to the other possible causes of trouble in the respective test step.



1 = Return port (M 8 x 1)
2 = Inlet port (M 10 x 1)
3 = Electric terminal
4 = Intake-manifold-pressure connection port (after throttle valve)

14.2 Version of warm-up regulator

The warm-up regulator is a version for intake-manifold-pressure-controlled full-load enrichment. This means that the cold and warm control pressures are additionally influenced by the intake-manifold pressure acting on the full-load diaphragm of the warm-up regulator. The intake-manifold pressure connection port (4) is located on the top of the housing cover. In the base plate there is an opening for atmospheric pressure.



14.3 Checking the fuel delivery for the control-pressure circuit:

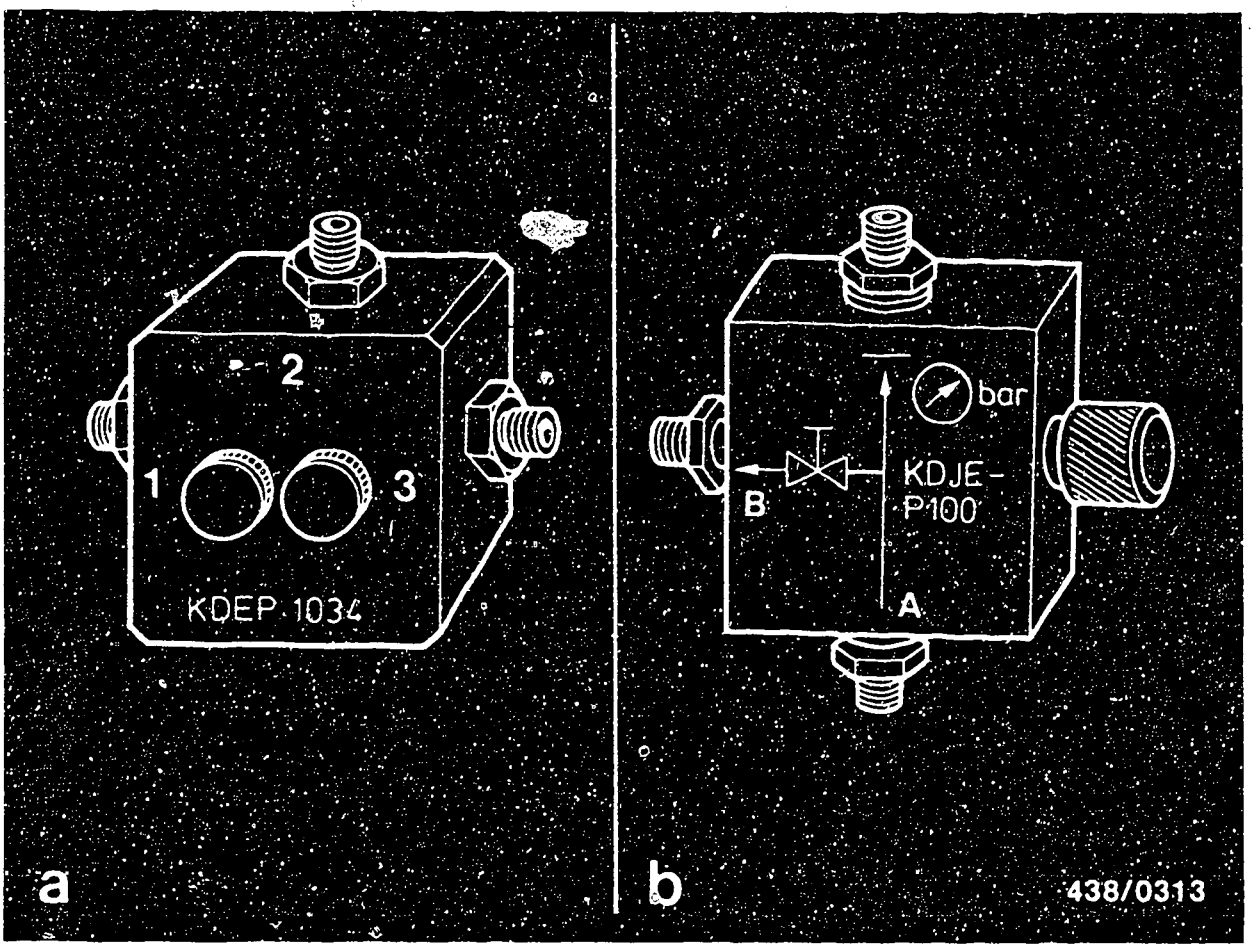
Before testing, make sure that the electric fuel pump is operating properly.
Test specification: min. 930 cm^3/30 s.

Unscrew the control-pressure line (to the warm-up regulator) from the fuel distributor and screw connecting piece (thread M 8 x 1/M 12 x 1.5) from connecting parts set KDJE-P 100/10 on control-pressure port.
Connect one of the two connecting hoses of the pressure tester KDJE-P 100 (previously KDEP 1034) to the control-pressure port of the fuel distributor (threads M 12 x 1.5) and hold hose in graduate (approx. 0.5 litre capacity).

Switch on the electric fuel pump for 1 minute by bridging the safety circuit.
Measure delivery.

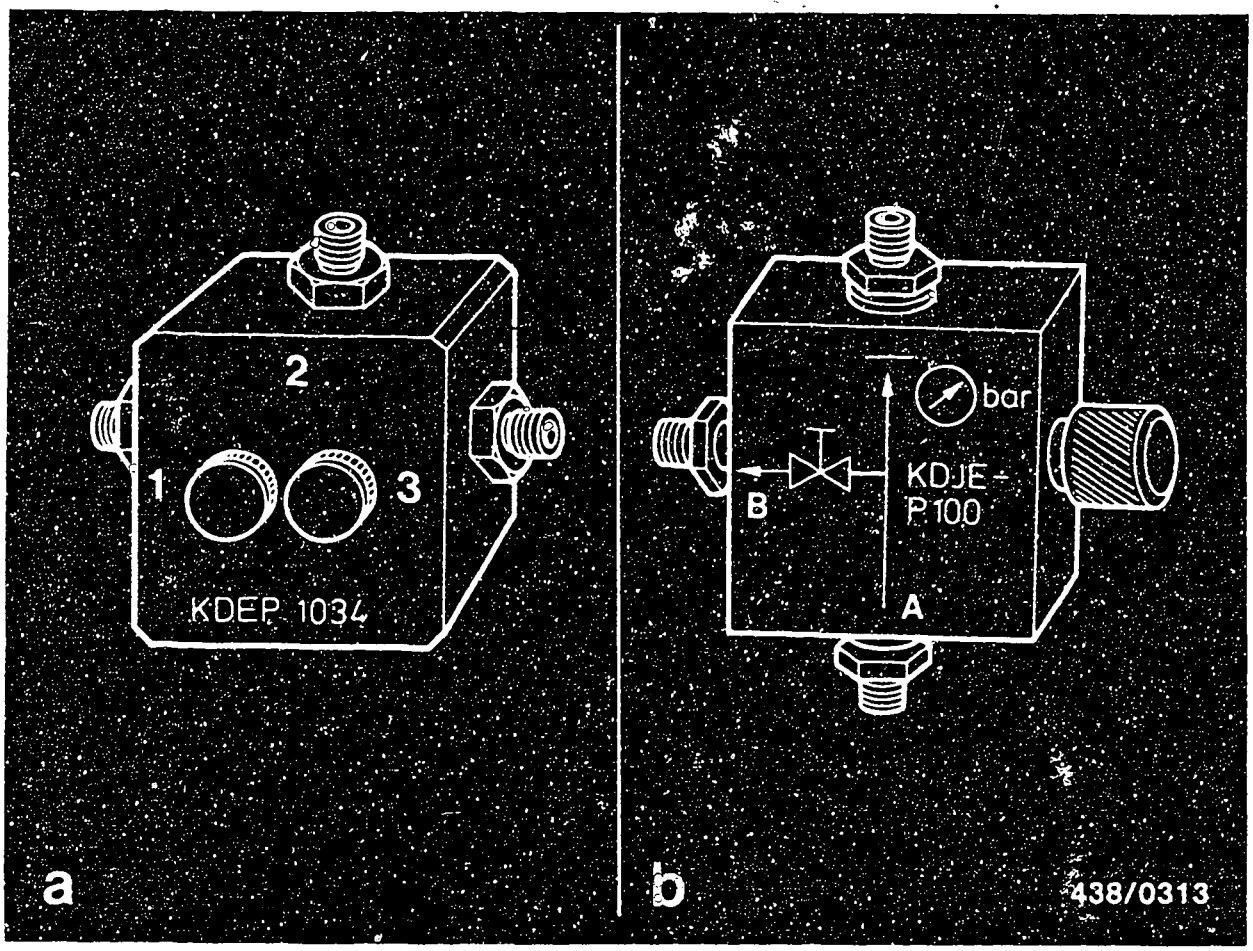
Test specification: 160...240 cm^3/min.

If the measured value is outside tolerance, the fault is in the fuel distributor.
Replace the fuel distributor.



14.4 Mounting the pressure tester KDJE-P100 (formerly KDEP 1034):

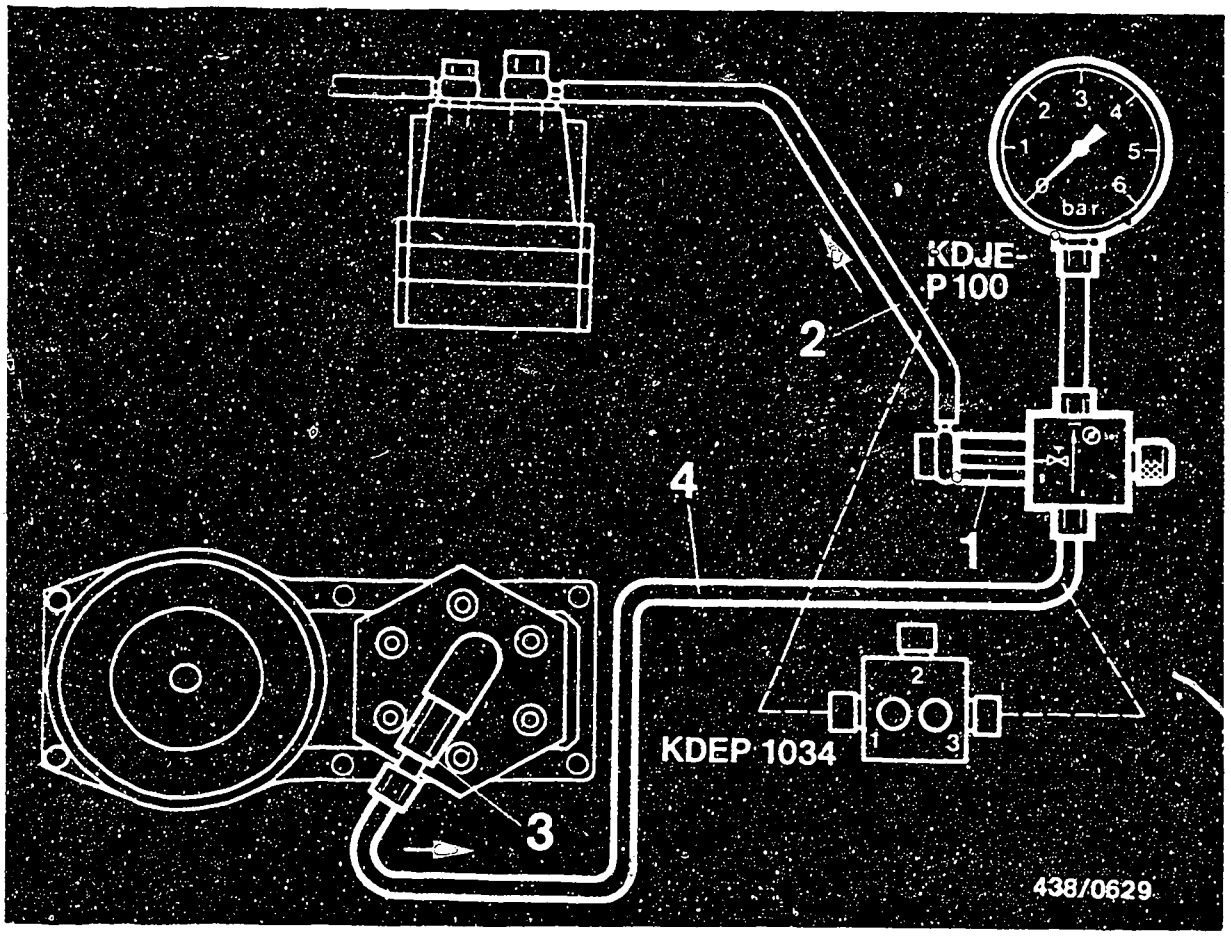
The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a).



Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



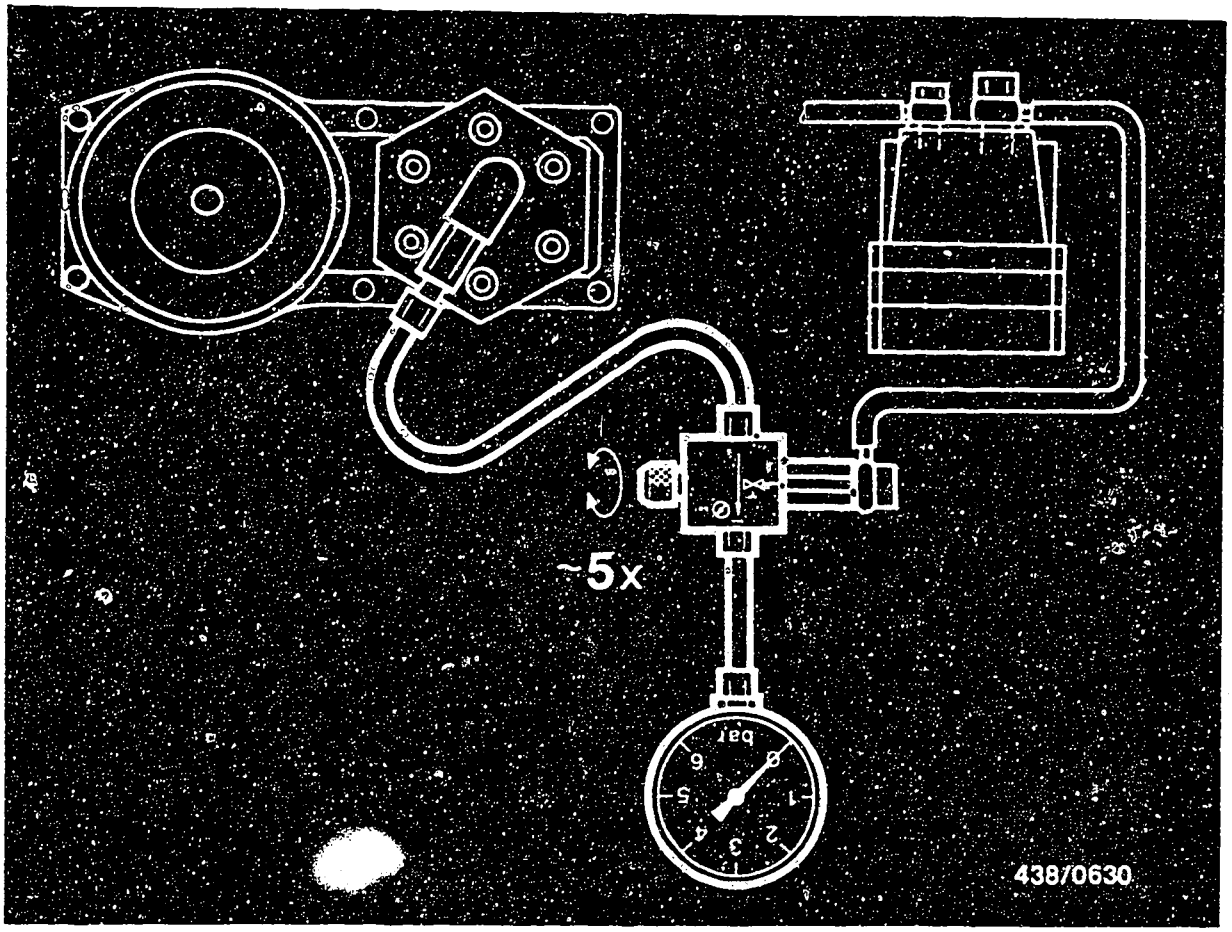
The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.

The connecting-parts set KDJE-P 100/10 is required.

Screw the adapter of connecting-parts set with seal ring onto connection part B or 1 of the directional-control valve (1).

Unscrew control-pressure line (to the warm-up regulator) from the fuel distributor and connect it to the adapter (2).

Screw the connecting piece of the connecting-parts set to the control-pressure connection port of the fuel distributor (3) and connect it with connection port A or 3 of directional-control valve via connecting hose (4).

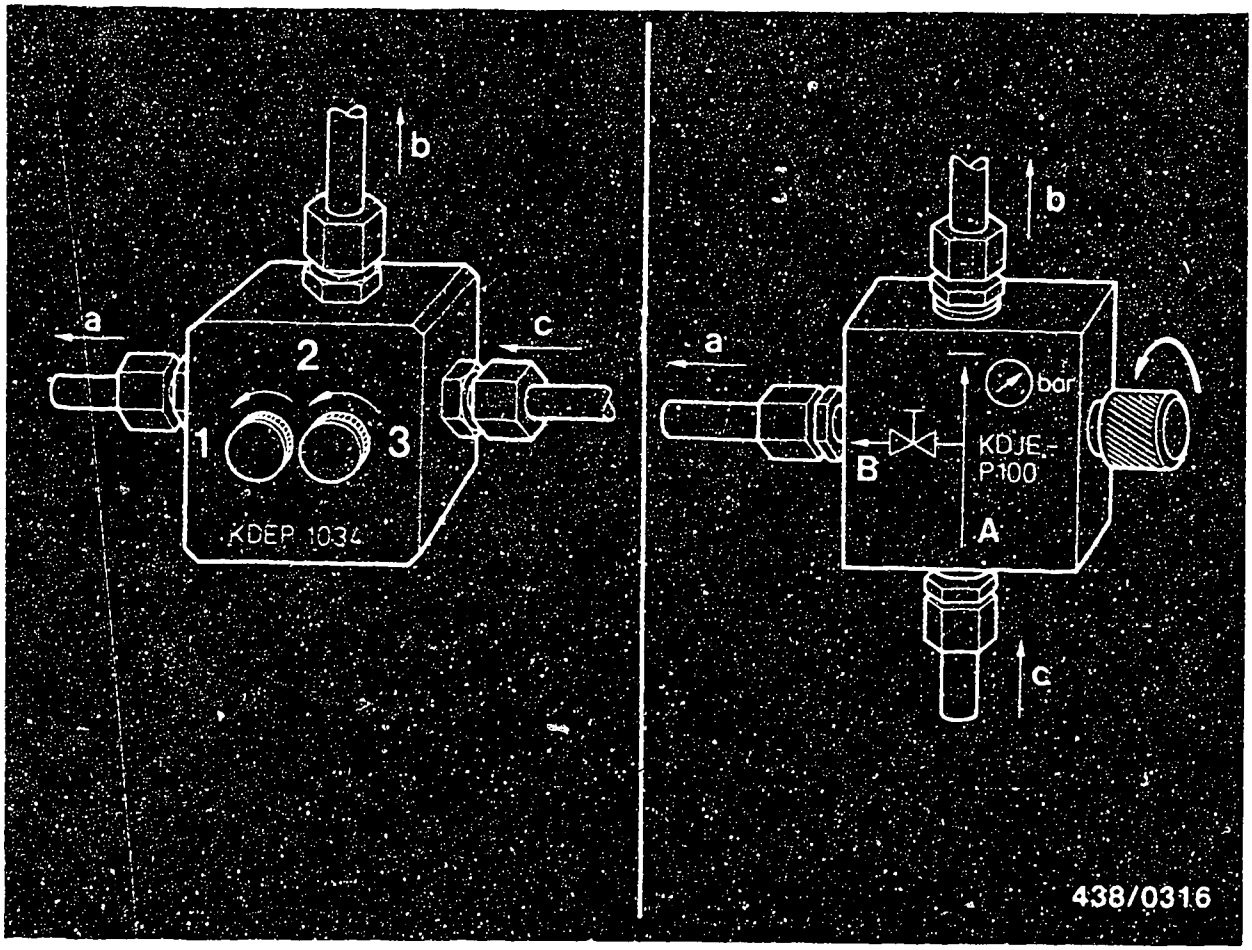


14.5 Bleeding the pressure tester:

Disconnect the electric plug from the warm-up regulator and from the auxiliary-air device.

Let the pressure gauge hang down (hose fully extended). Switch on the electric fuel pump by bridging the electrical safety circuit.

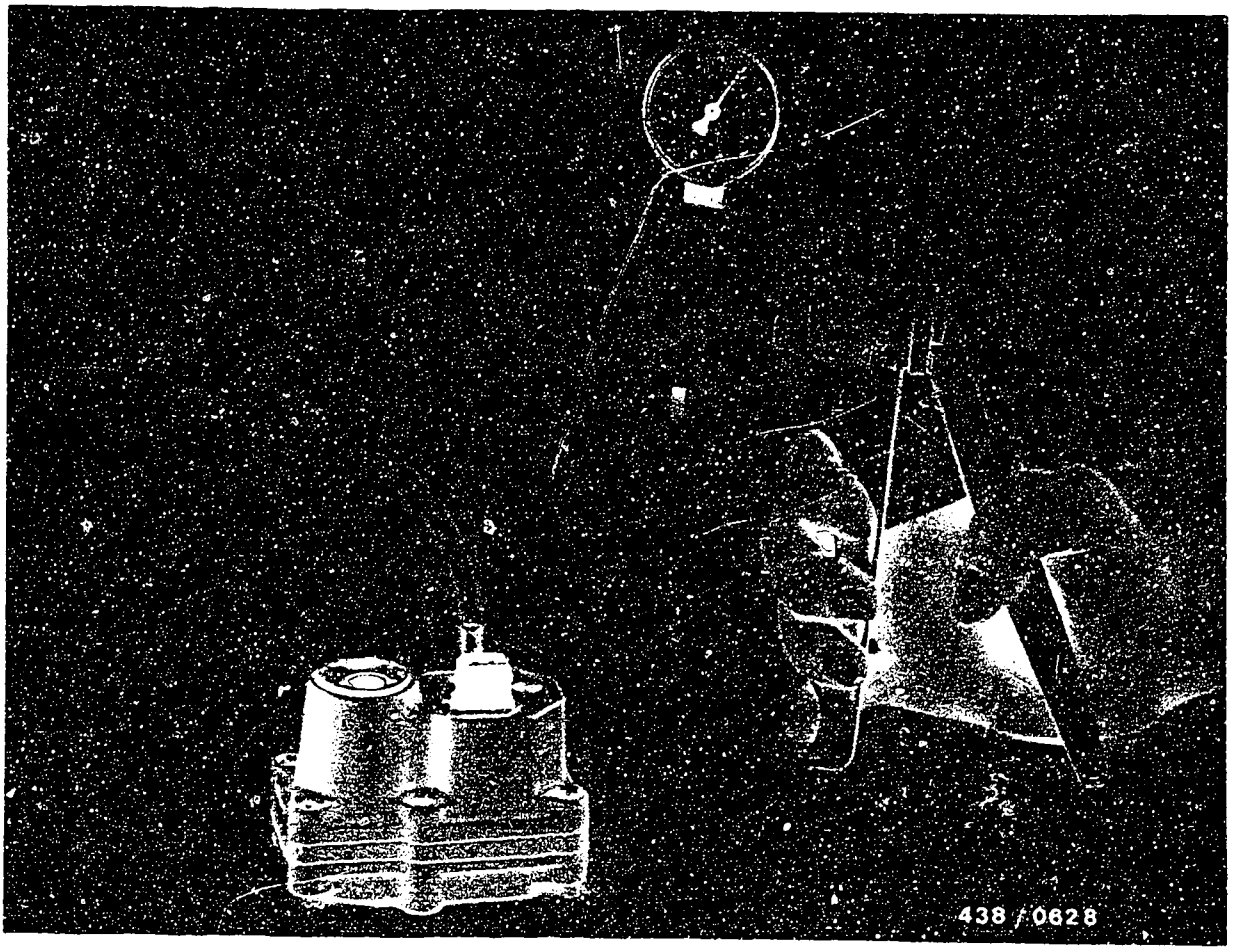
Open and close the valve screw of the directional-control valve (valve screw 1 in the case of KDEP 1034) in a 10-second rhythm about 5 times. Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood). Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel ditributor

14.6 Testing the "cold" control pressure

The test is performed with the engine switched off. The engine must be cold. For this purose, the engine should have been switched off for several hours, preferably overnight.
Pull off the plug from the warm-up regulator.
Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034). Switch on the electric fuel pump by bridging the electrical safety circuit.

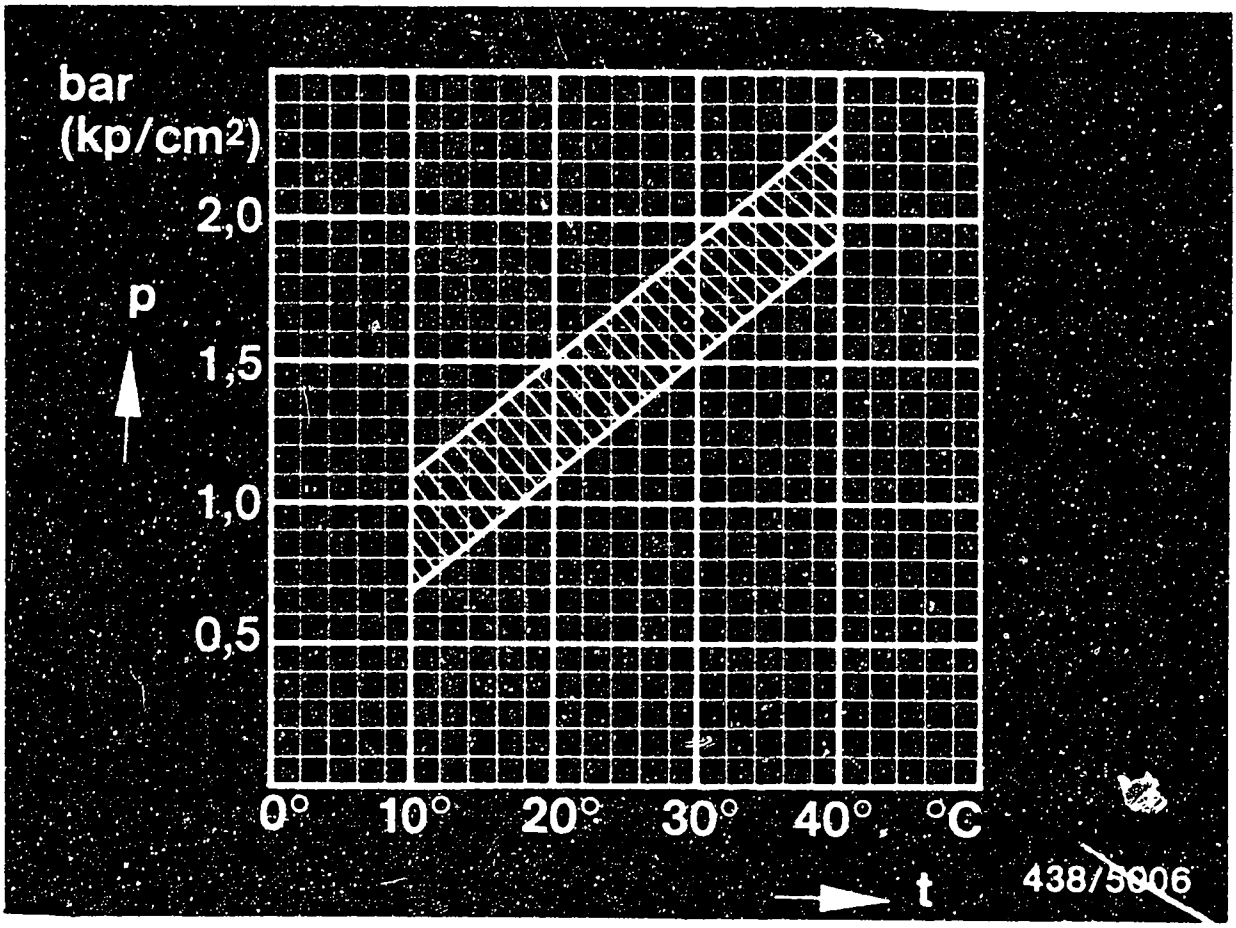


The control pressure is tested with simulated intake-manifold pressure, i.e. by applying vacuum to the warm-up regulator.

To do this, connect the vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator on the top of the housing. The picture shows testing with the recommended Mityvac hand vacuum pump.

Setting value for testing: 510...550 mbar (385...415 mmHg)

The "cold" control pressure is indicated on the pressure gauge of the pressure tester.



p = Control pressure (bar or kgf/cm² gauge pressure)
t = Ambient temperature (°C)

Warm-up regulator Part No.: 0 438 140 038
0 438 140 052

Calculate the nominal control pressure in accordance with the ambient temperatures in the graph.

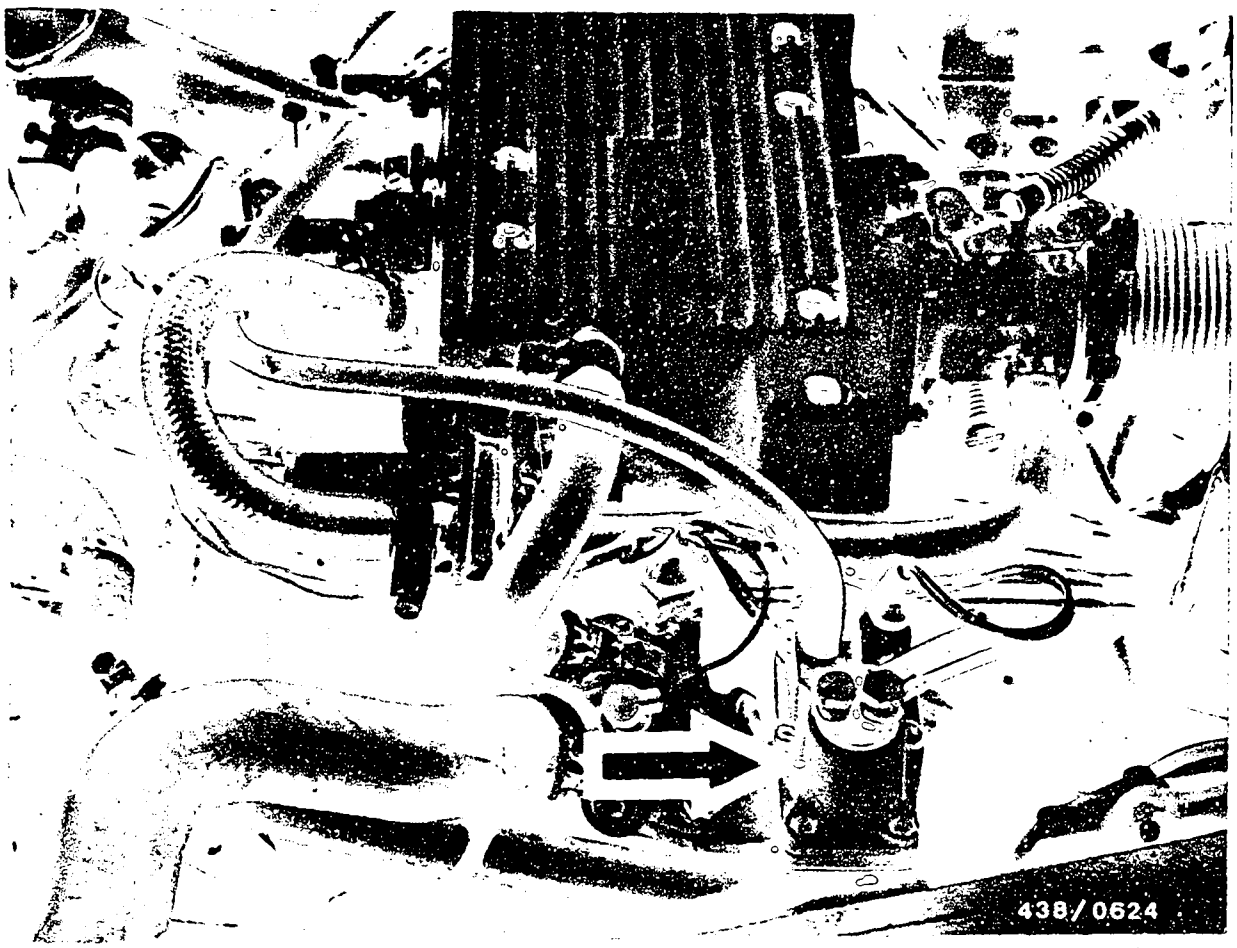
Example: Ambient temperature = 20°C
Nominal control pressure = 1.1...1.5 bar gauge pressure

If the measured "cold" control pressure differs from the nominal value, this may be due to one of the following faults:

- Fuel delivery for the control-pressure circuit too low or too high. Test fuel delivery. Test specification: 160...240 cm^3/min.

- Fuel return from the warm-up regulator blocked or constricted (if control pressure too high). Eliminate constriction.

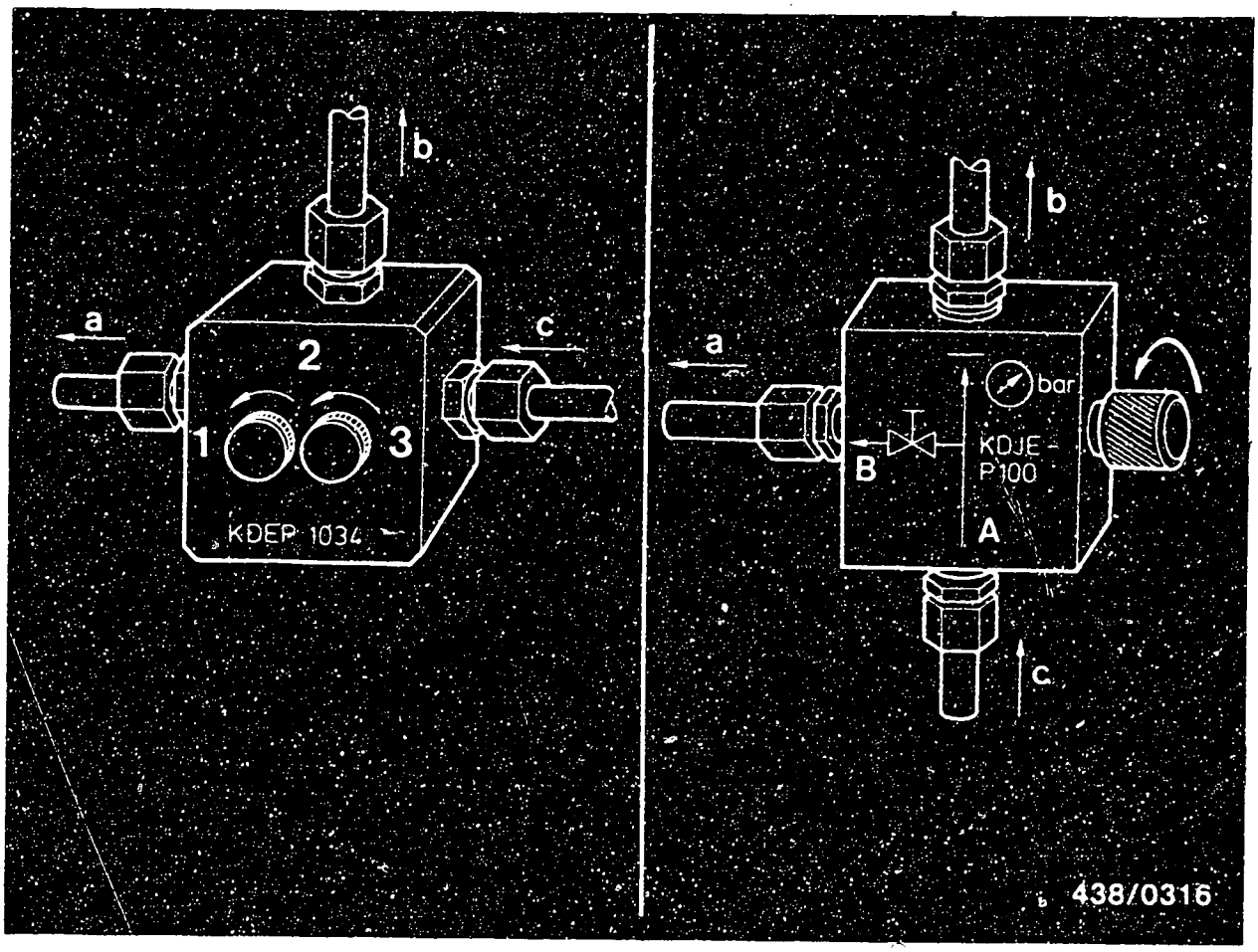
- Warm-up regulator defective. Replace warm-up regulator.



14.7 Removing and installing the warm-up regulator:

The removal and installation of the warm-up regulator (arrow) poses no problems.
When connecting the fuel lines, always use new seal rings.

Finally, check the condition and correct fitting of the connection hose from the intake manifold to the warm-up regulator. If necessary, replace the hose.
When the warm-up regulator has been replaced or a fault remedied, carry out the idle adjustment with the engine at normal operating temperature.
Idle adjustment is described on Coordinates G 4.

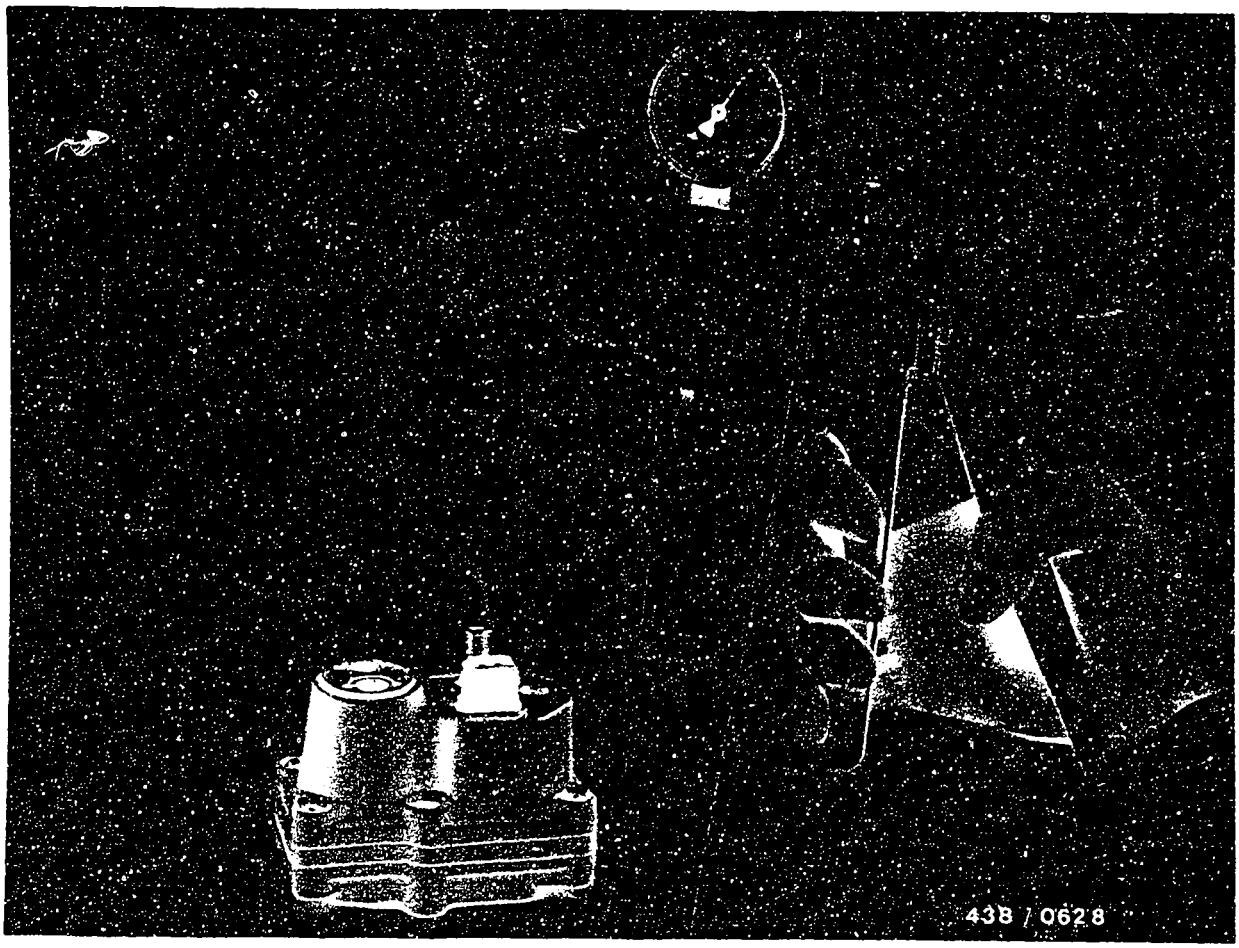


a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

14.8 Testing the "cold" control pressure:

Fuel distributor Part No.: 0 438 140 038
0 438 140 052

The test is performed with the engine switched off, once without intake-manifold pressure being applied, once with simulated intake-manifold pressure (vacuum) applied. Open the valve screw of the directional-control valve (or both valves in the case of KDEP 1034).



For testing with simulated intake-manifold pressure, connect the vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator (on the top of the housing near the plug housing).
The picture shows testing with the recommended Mityvac hand pump.

Setting value for testing: 510...550 mbar (385...415 mmHg)

Test procedure:

The temperature of the engine is not important.

Open the hollow screw of the directional-control valve (both in the case of KDEP 1034).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Plug the plug onto the warm-up regulator.

The control pressure now rises (warm-up regulator in the process of shutting off) until the "warm" control pressure is reached.

Test first of all without intake-manifold pressure, then test with simulated intake-manifold pressure (vacuum) according to the values given below (next coordinate):

Test step	Test specifications*

"Warm" control pressure

Part no. of warm-up regulator: 0 438 140 038
(Version for intake-manifold-pressure-controlled full-load enrichment)

- Test with atmospheric pressure (without vacuum): 3.0...3.4 bar (3.1...3.5 kgf/cm^2)

- For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.

  Setting values: 510...550 mbar (385...415 mmHg): 3.4...3.8 bar (3.5...3.9 kgf/cm^2)

*Pressures in the test-specification table are given in bar (gauge pressure) and/or in kgf/cm^2 (gauge pressure).

Test step	Test specifications*

"Warm" control pressure

Part no. of warm-up regulator: 0 438 140 052
(Version for intake-manifold-pressure-controlled full-load enrichment)

- Test with atmospheric pressure (without vacuum): 2.7...3.1 bar (2.8...3.2 kgf/cm^2)

- For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.

  Setting values:
  510...550 mbar
  (385...415 mmHg): 3.4...3.8 bar (3.5...3.9 kgf/cm^2)

*Pressures in the test-specification table are given in bar (gauge pressure) and/or in kgf/cm^2 (gauge pressure).

If the measured "warm" control pressure differs from the test specification, this may be due to one of the following faults:

If control pressure too high:

- Fuel delivery for the control-pressure circuit too high.
  Test fuel delivery.
  Test specification: 160...240 cm^3/min.

- Fuel return from the warm-up regulator blocked or constricted.
  Eliminate constriction.

- Warm-up regulator has hydraulic defect.
  Replace warm-up regulator.

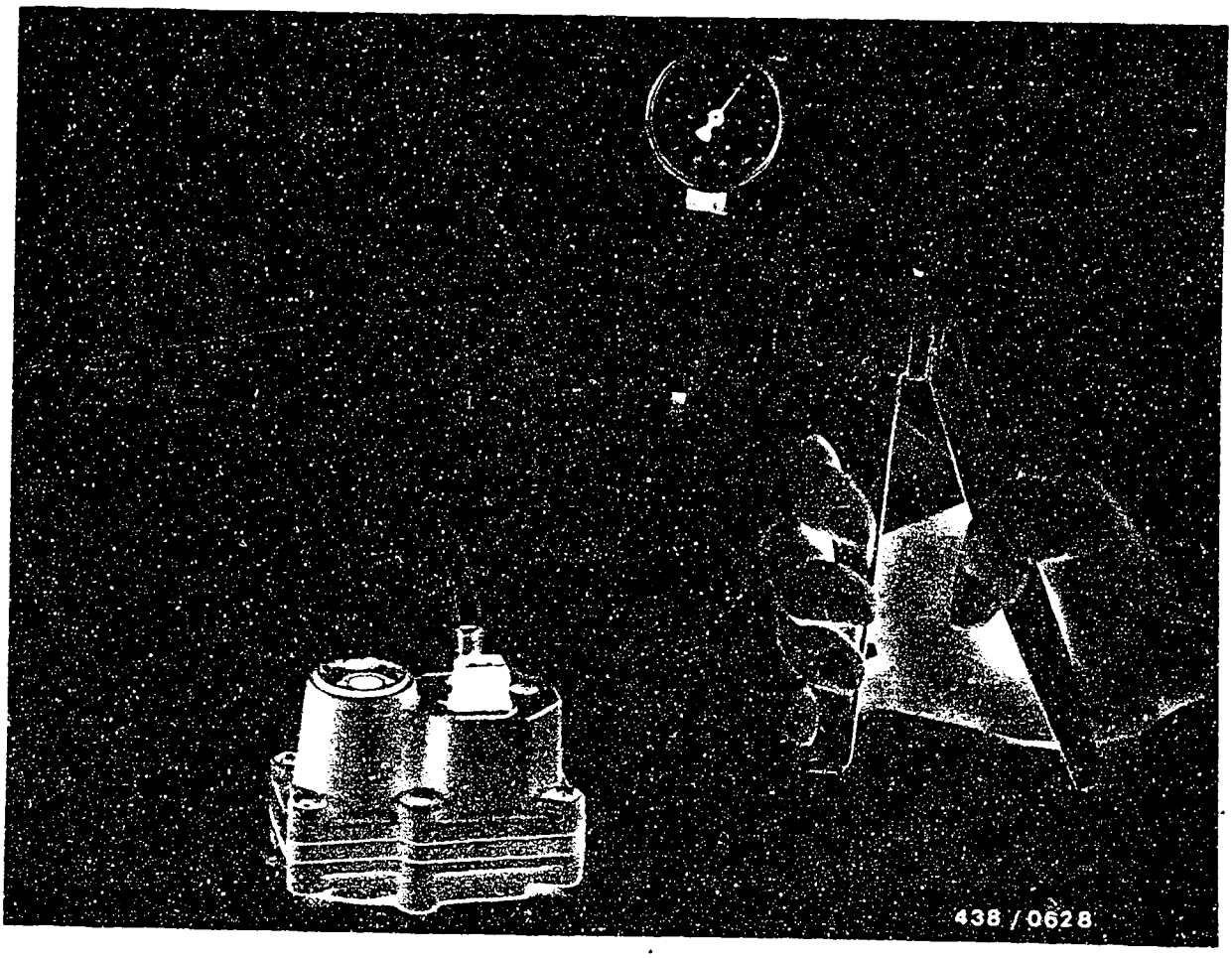
If control pressure too low:

- Power supply open-circuit.
  Eliminate open circuit. Ensure that the plug is contacting properly.

- Battery voltage too low, voltage drop.
  Eliminate voltage drop. Minimum voltage at connector: 11.5 V.
  If necessary, repeat test with engine running in order to obtain the normal generator voltage of approx. 14 V when the vehicle is in operation.

- Fuel delivery for the control-pressure circuit too low.
  Test fuel delivery.
  Test specification: 160...240 cm^3/min.

- Warm-up regulator defective. Heating coil open-circuit. Hydraulic defect. Replace warm-up regulator.

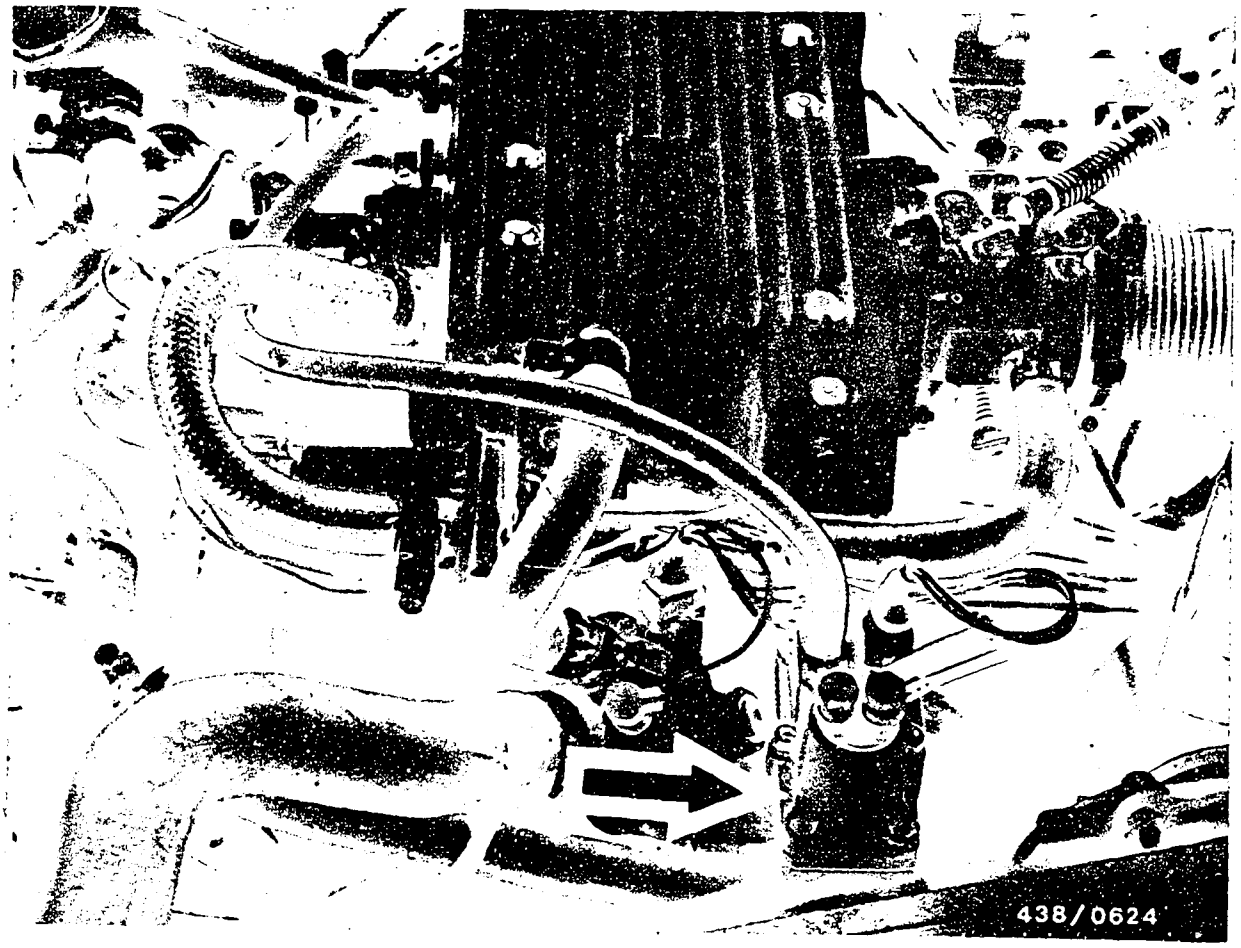


14.9 Testing the full-load diaphragm for leaks

Switch off the electric fuel pump.
Connect the "Mityvac" hand vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator and build up a vacuum.
Setting value: 510...550 mbar (385...415 mmHg)

Test specification for air leaks:
Max. pressure drop within 15 s 100 mbar (75 mmHg).
If the pressure drop is too great, replace the warm-up regulator.

When the warm-up regulator has been replaced or a fault in the control-pressure circuit remedied, carry out the idle adjustment with the engine at normal operating temperature. Idle adjustment is described on Coordinates G 4.



14.10 Removing and installing the warm-up regulator:

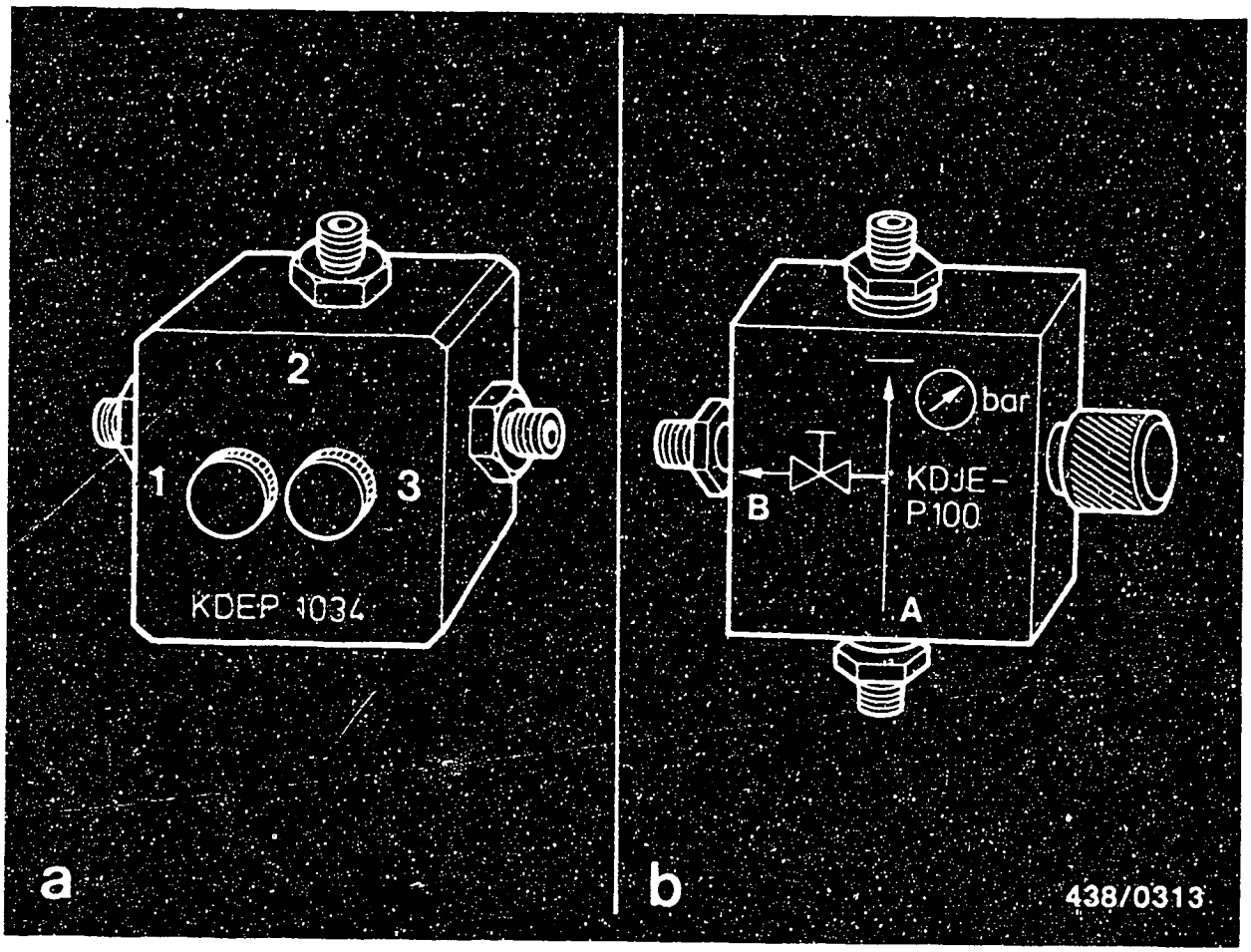
The removal and installation of the warm-up regulator (arrow) poses no problems.

When connecting the fuel lines, always use new seal rings.

Finally, check the condition and correct fitting of the connection hose from the intake manifold to the warm-up regulator. If necessary, replace the hose.

When the warm-up regulator has been replaced or a fault remedied carry out the idle adjustment with the engine at normal operating temperature.

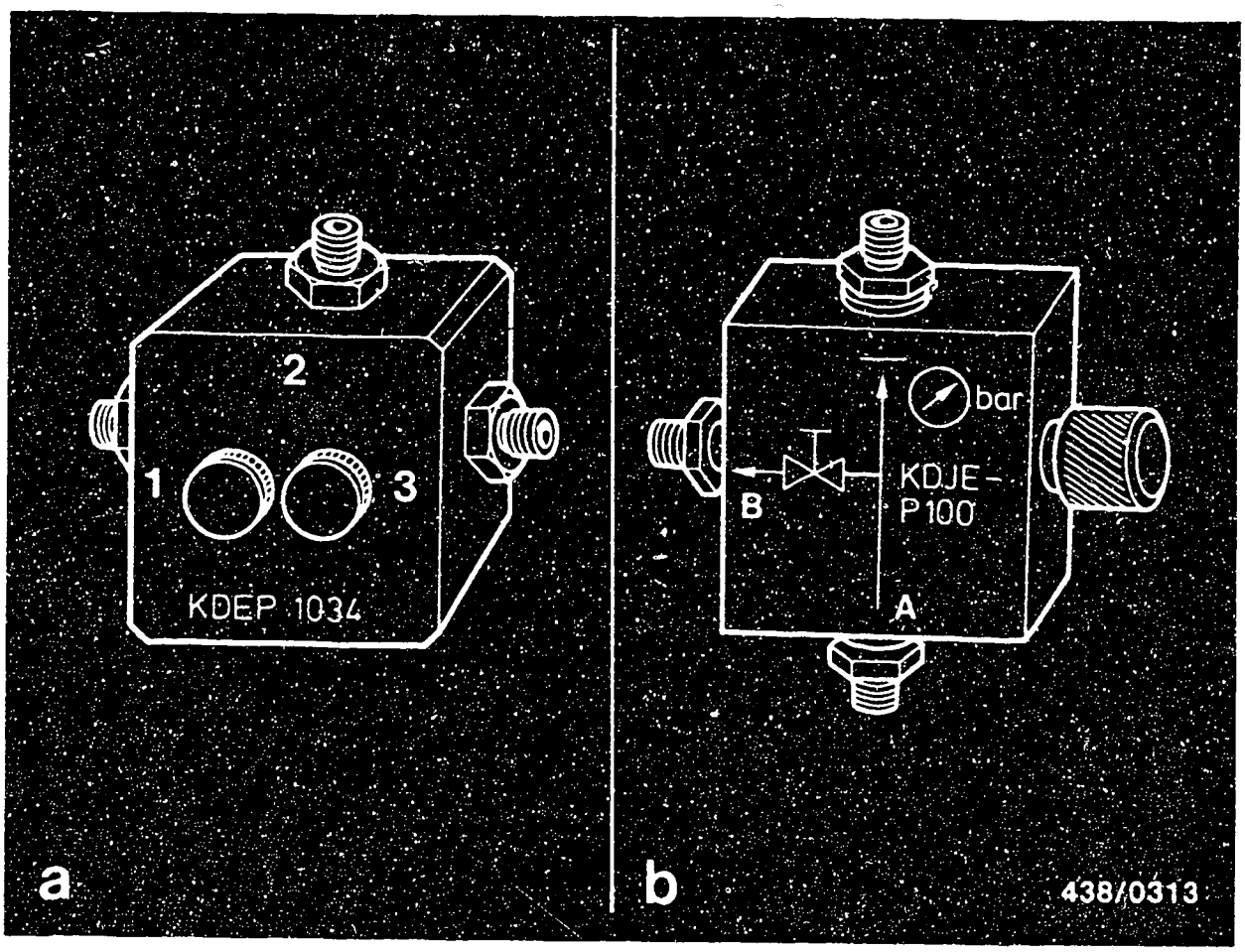
Idle adjustment is described on Coordinates G 4.



15. Testing and adjusting the primary (system) pressure:

15.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a).

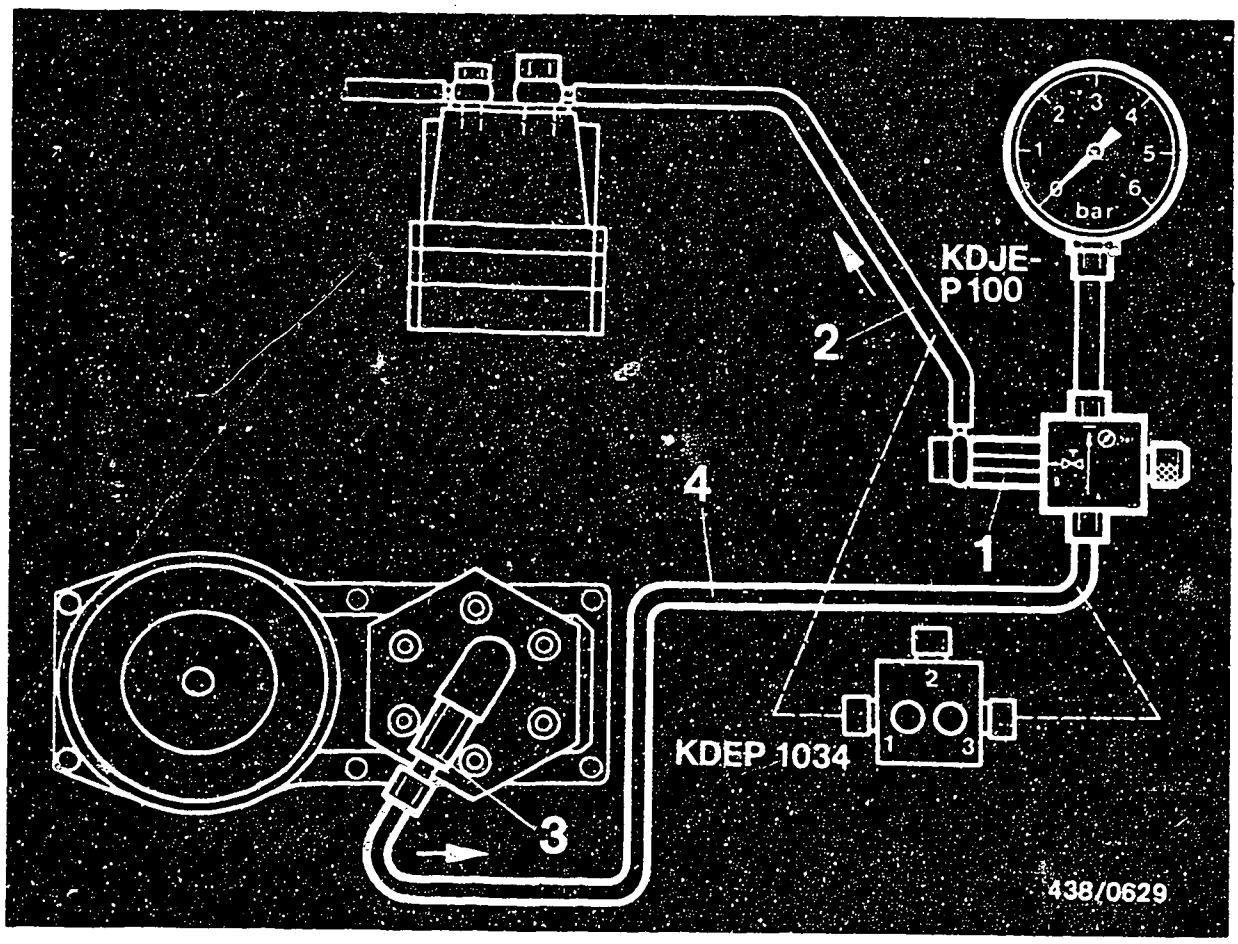


Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

Caution:

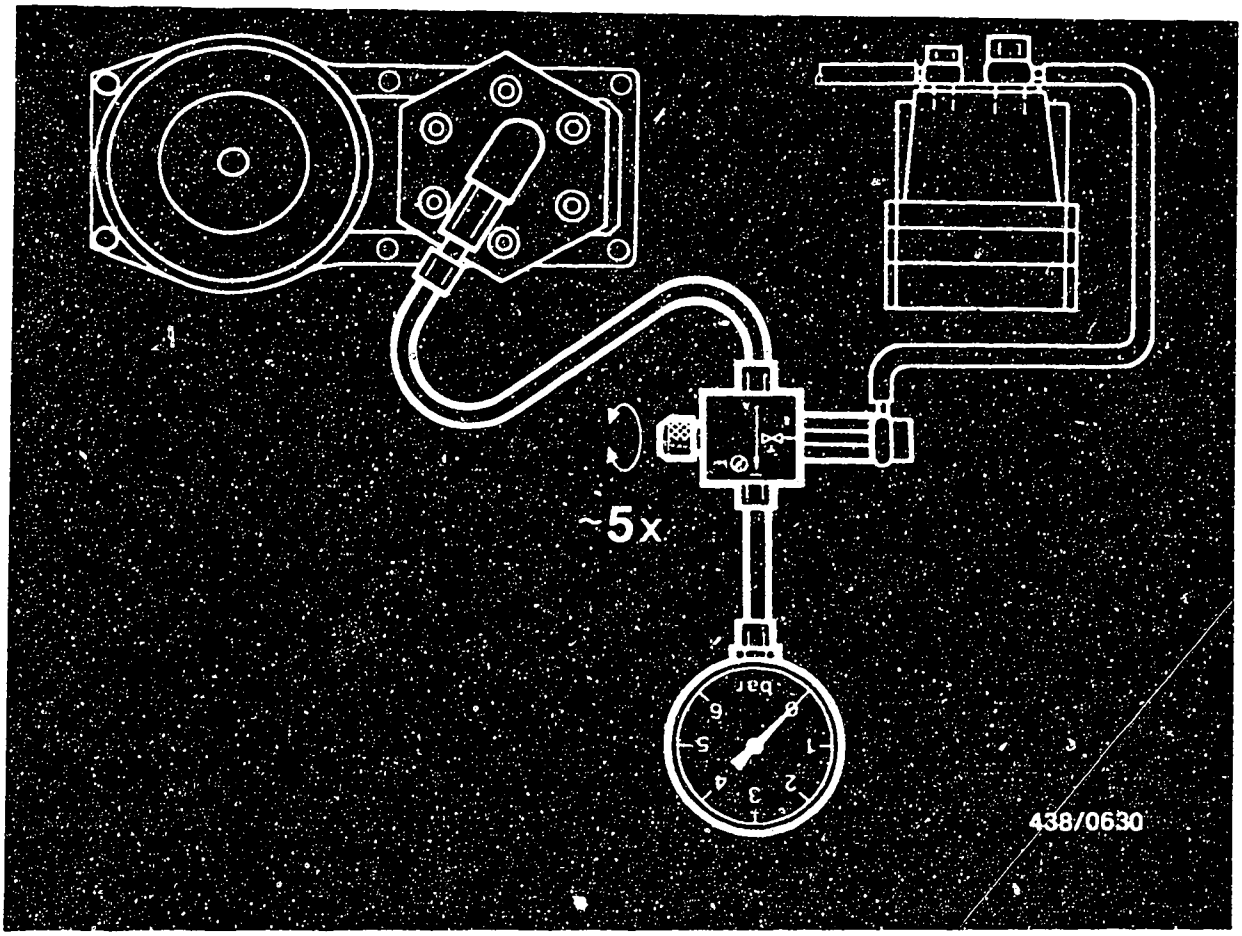
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.

Fit using connecting-parts set KDJE-P 100/10.

Screw the adapter of the connecting-parts set with a seal ring onto connection B (or 1 as the case may be) of the directional-control valve (1).
Unscrew the control-pressure line (to the warm-up regulator) on the fuel distributor and connect to adapter (2).
Screw the connecting part of the connecting-parts set onto the control-pressure connection of the fuel distributor (3) and connect to connection A (or 3) of the directional-control valve via a hose line (4).

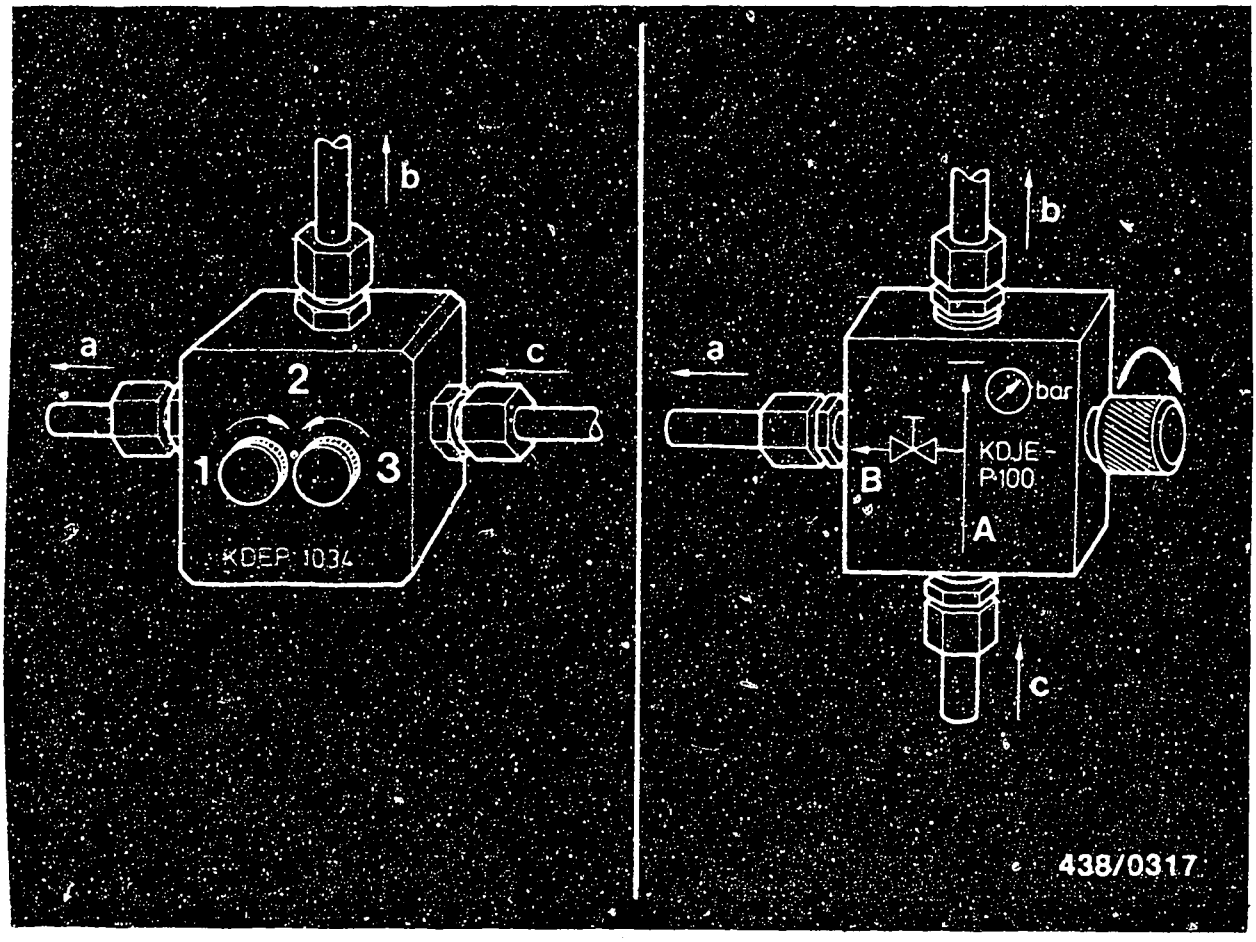


15.2 Bleeding the pressure tester:

Disconnect the electric plug from the warm-up regulator.

Let the pressure gauge hang down (hose fully extended). Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve (valve screw 1 in the case of KDEP 1034) in a 10-second rhythm about 5 times. Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood). Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

15.3 Testing the primary pressure:

The test is performed with the engine switched off. The temperature of the engine is not important. Close the valve screw of directional-control valve KDJE-P 100.
In the case of KDEP 1034, close valve screw 1, open valve screw 3.

Switch on the electric fuel pump by bridging the electrical safety circuit.
Primary pressure is now indicated on the pressure gauge.

Part no. of fuel distributor	Test specifications for primary pressure*
0 438 100 025 (78/79 model):	4.5...5.2 bar (4.6...5.3 kgf/cm^2)
0 438 100 080 (from 80 model):	4.7...5.4 bar (4.8...5.5 kgf/cm^2)

Possible causes of primary pressure being too low:

- Fuel supply not OK.
  (Delivery of electric fuel pump too low).

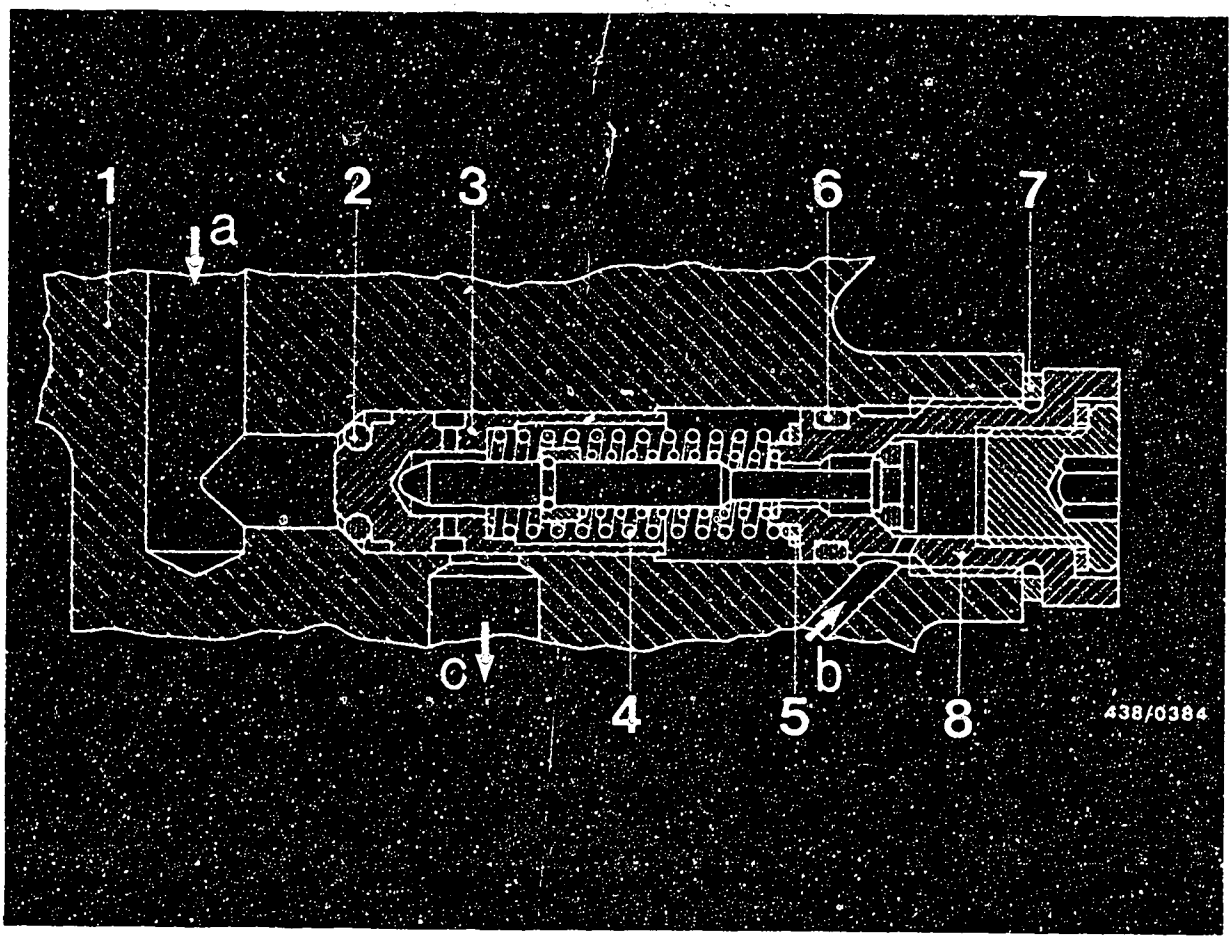
- Primary pressure incorrectly adjusted.
  Before re-adjusting primary pressure it must be ensured that the fuel supply is OK.
  Test specification: min. 930 cm^3/30 s.

Possible causes of primary pressure being too high:

- Constriction in the return line to the fuel tank.

- Primary pressure incorrectly adjusted.
  Before re-adjusting the primary pressure, therefore, always check first of all the condition of the return line to the fuel tank.

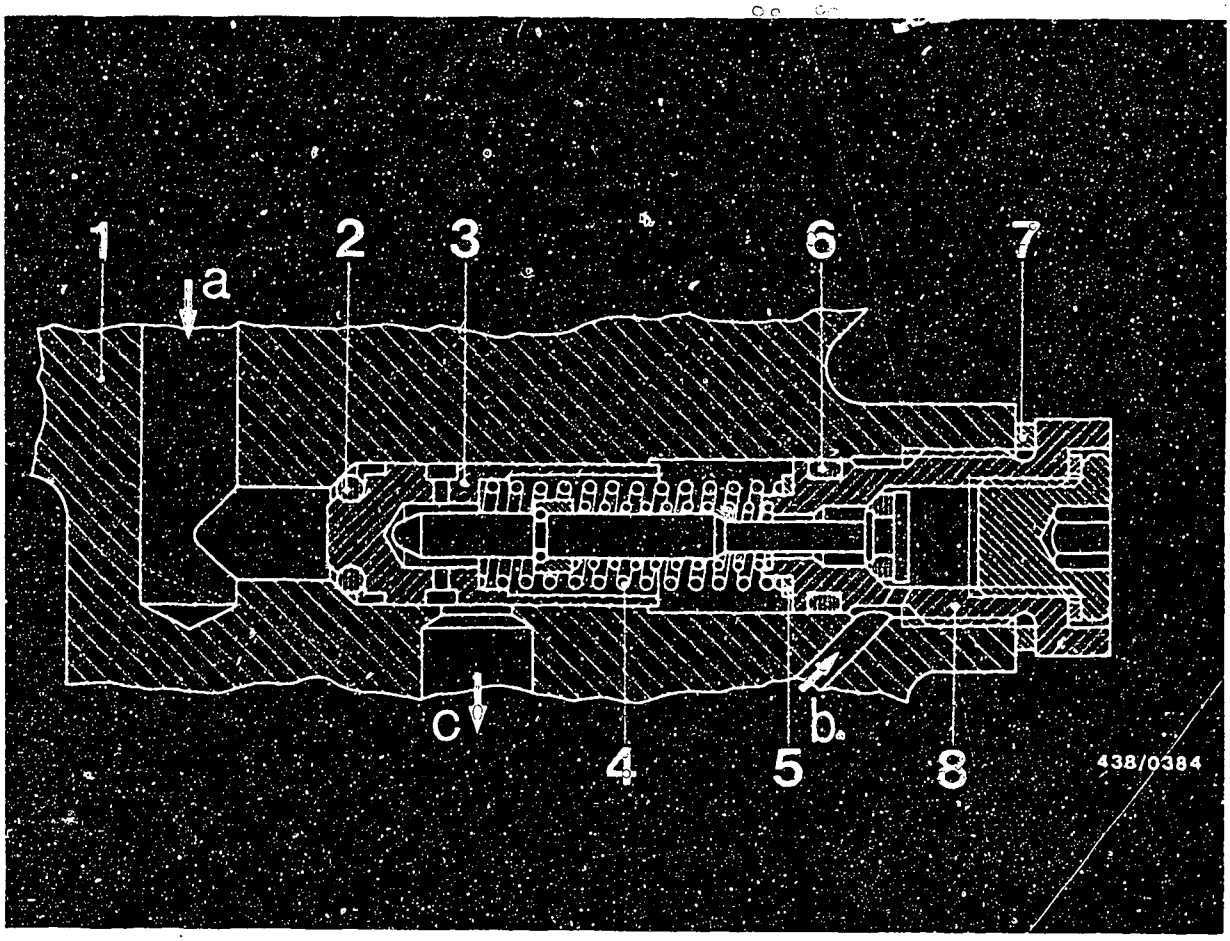
*Pressures are given in bar (gauge pressure) and/or in kgf/cm^2 (gauge pressure).



a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug

15.4 Adjusting the primary pressure:

Fuel distributor Part nO.	Adjustment values - primary pressure (gauge pressure)
0 438 100 025 (78/79 models):	4.7...4.9 bar (4.8...5.0 kgf/cm²)
0 438 100 080 (from 1980 model):	4.9...5.1 bar (5.0...5.2 kgf/cm²)

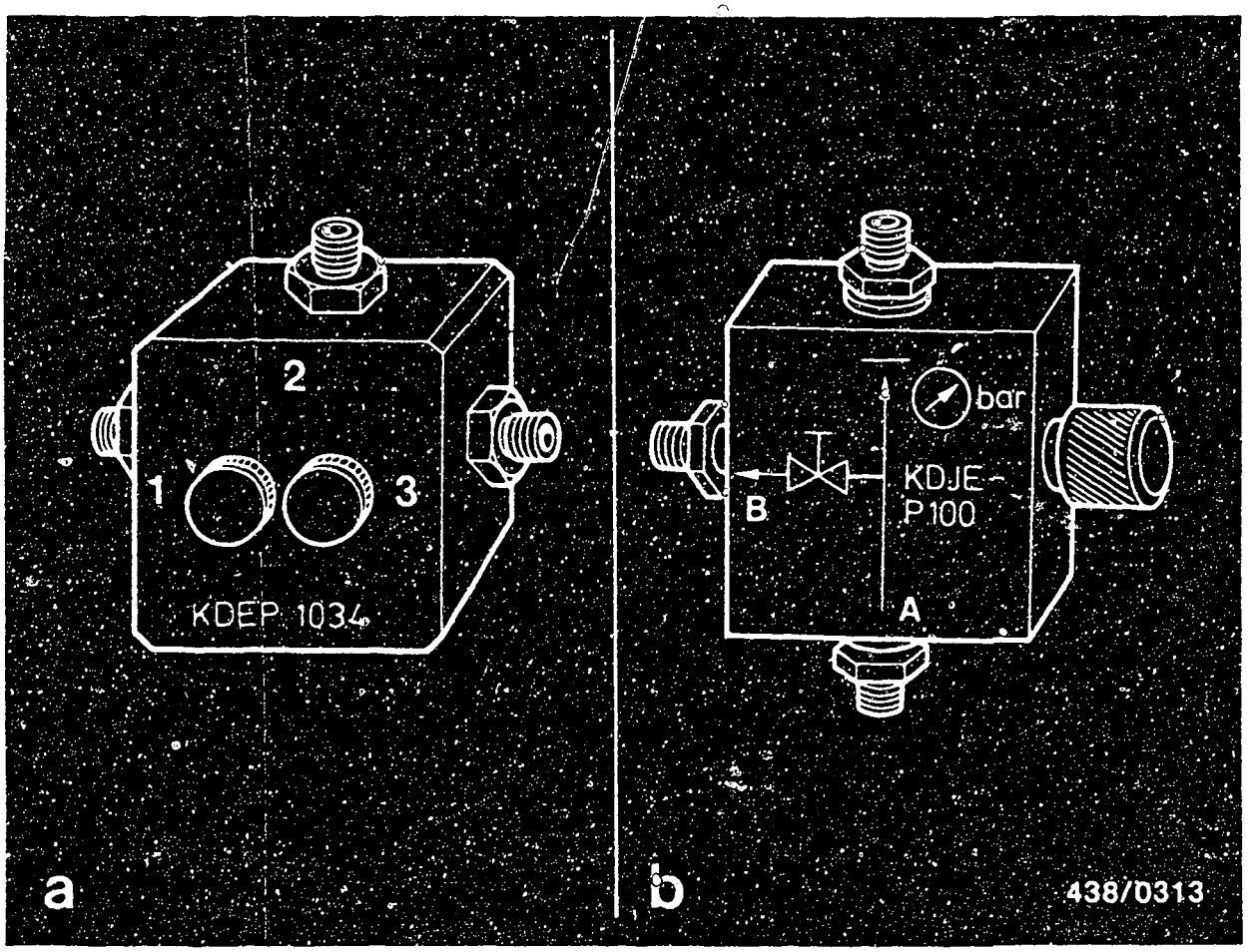


The primary pressure is readjusted by replacing the shims (Item 5).

Note:
0.1 mm more of shim thickness means about 0.15 bar pressure increase and vice versa.

To do this, screw out the large screw plug (Item 8) together with the push valve. After carrying out the adjustment, always fit the screw plug with a new flat seal ring (Item 7) and O-ring (Item 6).

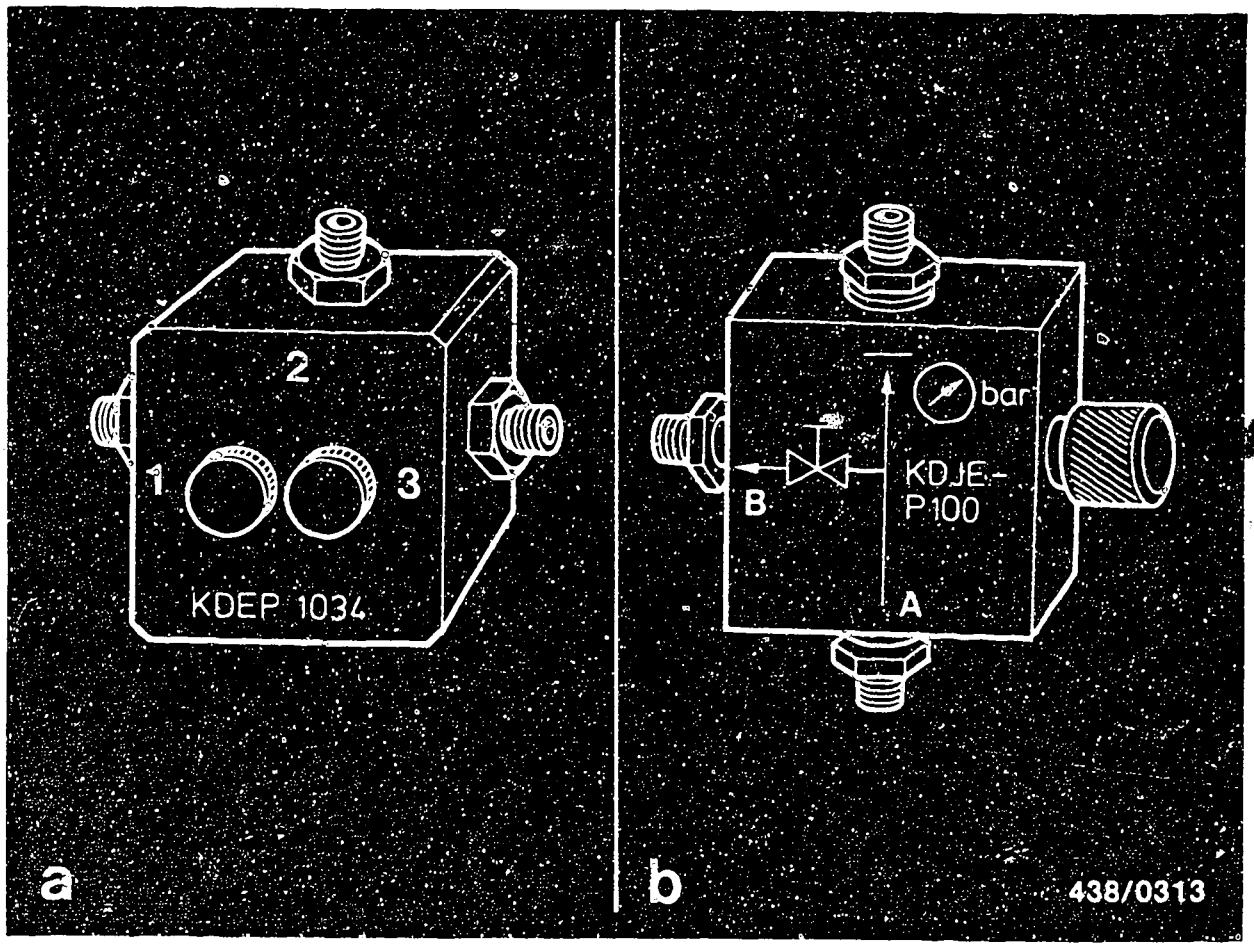
The control piston (Item 3) of the primary-pressure regulator must not be lost. It was matched specially to the fuel distributor housing in the manufacturing plant and therefore is the only part of the primary-pressure regulator which must not be replaced.



16. Testing the entire fuel system for leaks.

16.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a). Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b).

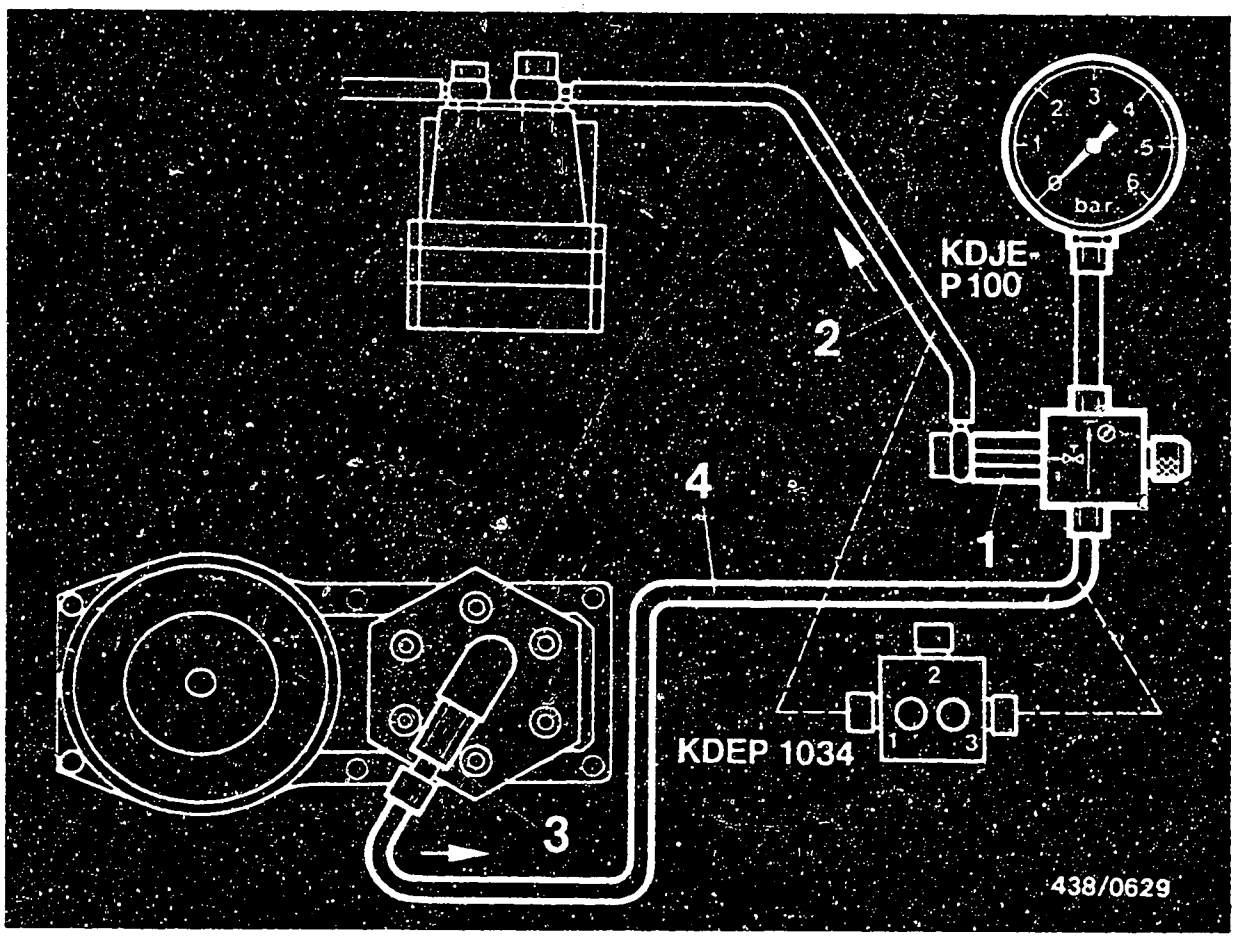


The connections of this directional-control valve are identified by symbols:

A = Inlet (from fuel distributor)
B = Outlet (to warm-up regulator)

Caution:

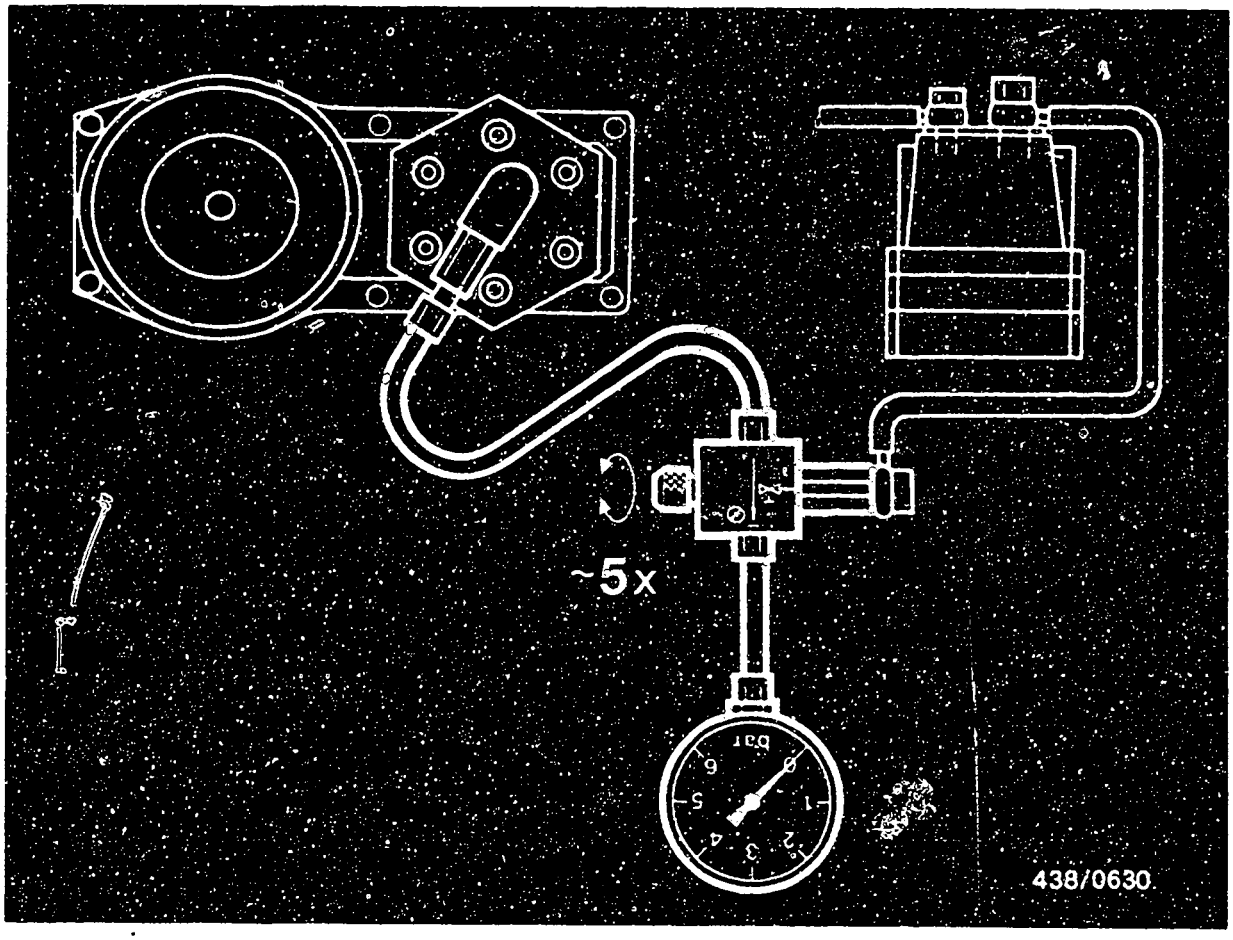
When the directional-control valve is not used, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.

Fit using connecting-parts set KDJE-P 100/10.

Screw the adapter of the connecting-parts set with a seal ring onto connection B (or 1 as the case may be) of the directional-control valve (1).
Unscrew the control-pressure line (to the warm-up regulator) on the fuel distributor and connect to adapter (2).
Screw the connecting part of the connecting-parts set onto the control-pressure connection of the fuel distributor (3) and connect to connection A (or 3) of the directional-control valve via a hose line (4).



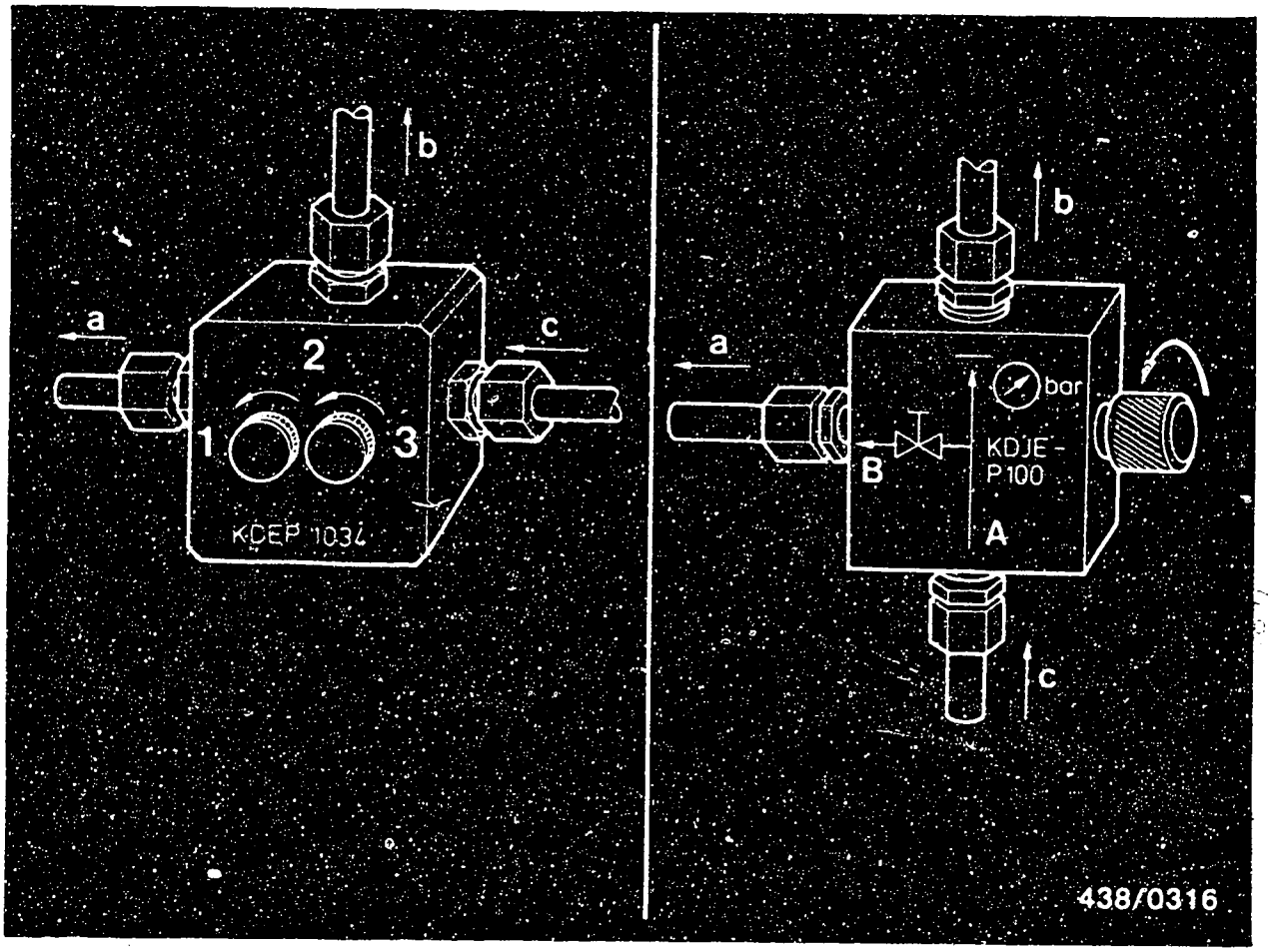
16.2 Bleeding the pressure tester:

Disconnect the electric plug from the warm-up regulator and from the auxiliary-air device.

Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw of the directional-control valve (in the case of KDEP 1034 , valve screw 1) in a 10-second rhythm about 5 times. Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood). Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).

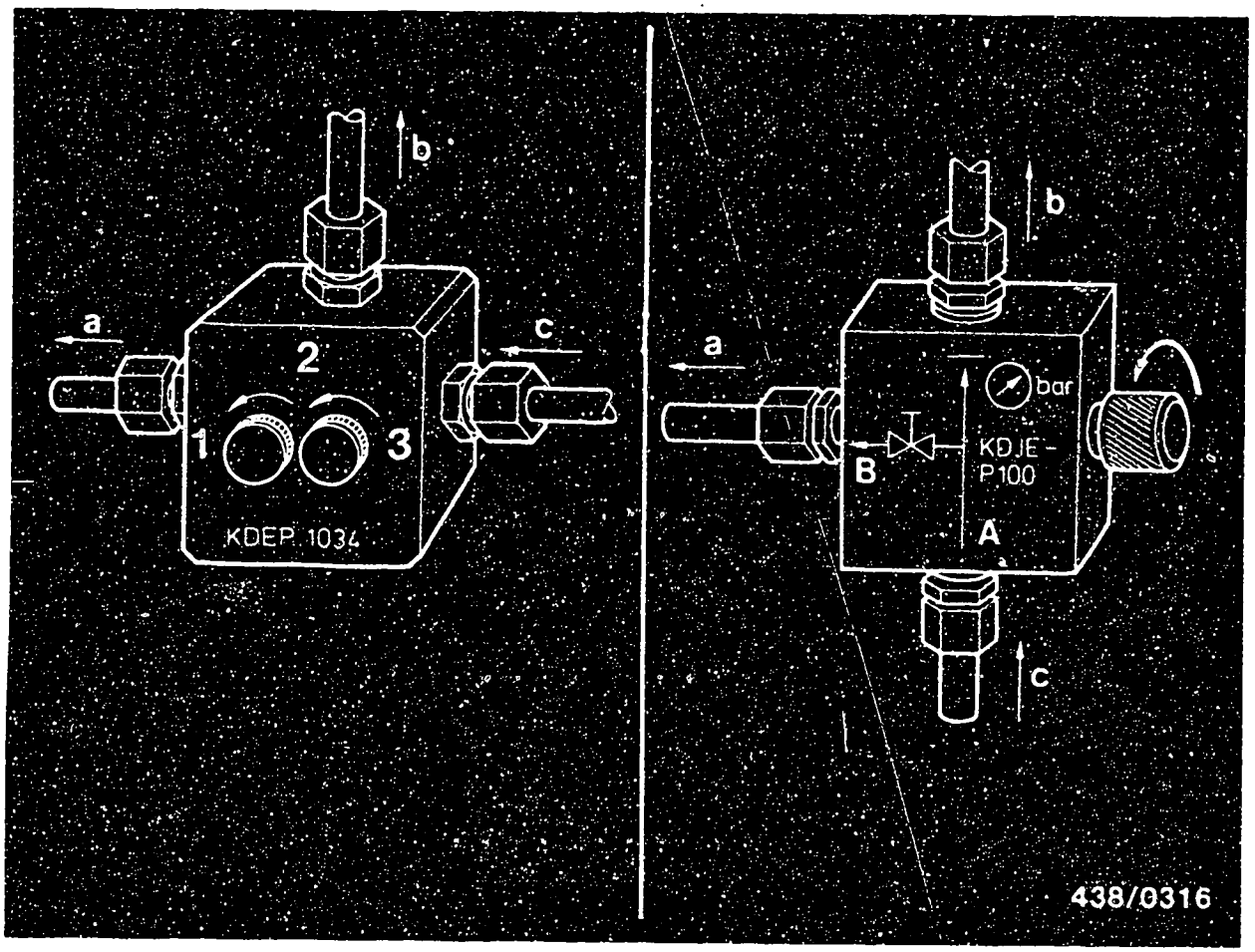


a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

16.3 Leak test:

The test is performed with the engine switched off. Make the test with a warm engine but not immediately after the engine has been operated at a high temperature.

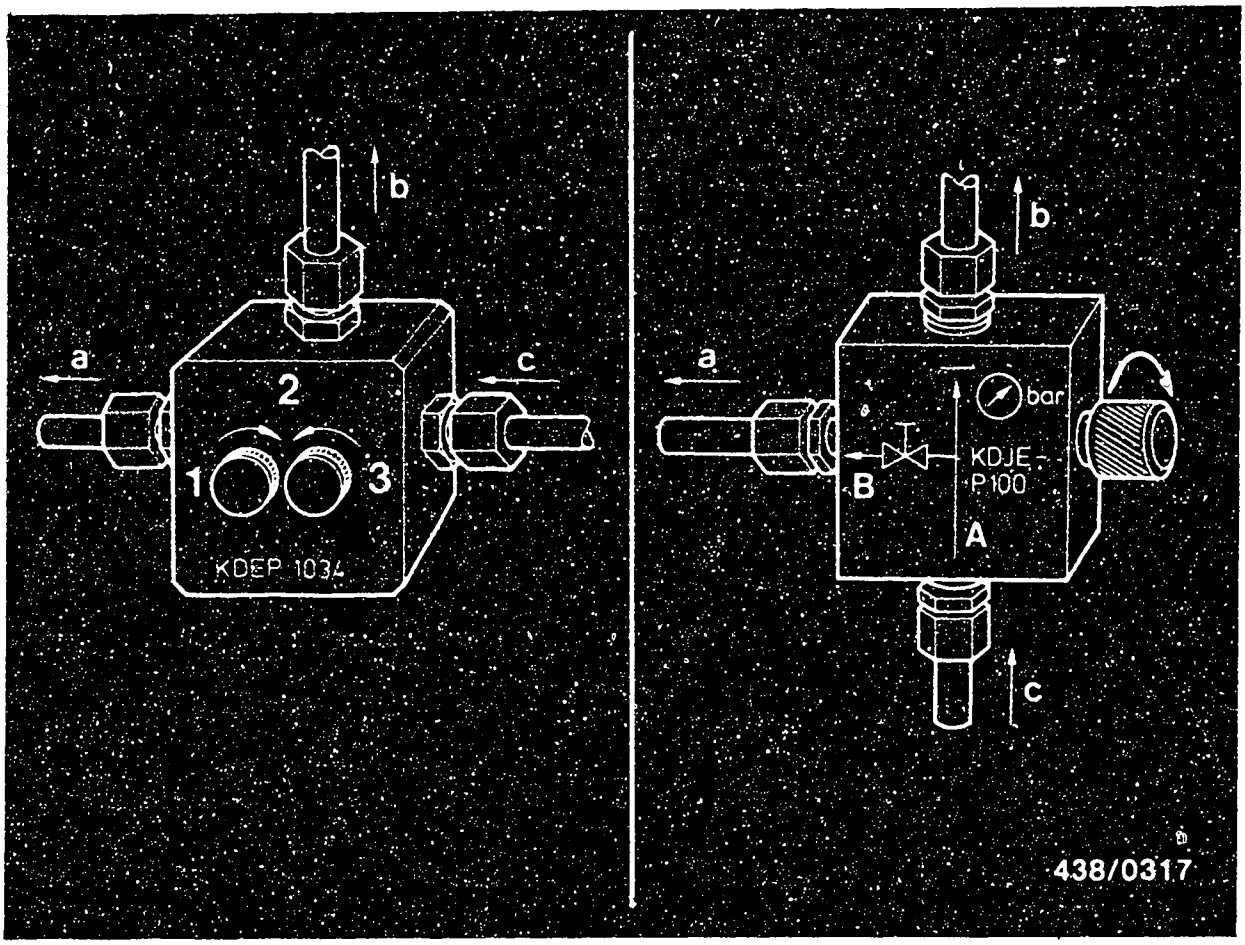
Open the valve screw of the directional-control valve (both valves in the case of KDEP 1034).



Switch on the electric fuel pump by bridging the electrical safety circuit until the warm-up regulator has ceased to operate ("warm" control pressure).
Switch the electric fuel pump off again and observe the drop in pressure on the pressure gauge.

Test specifications for leak test:

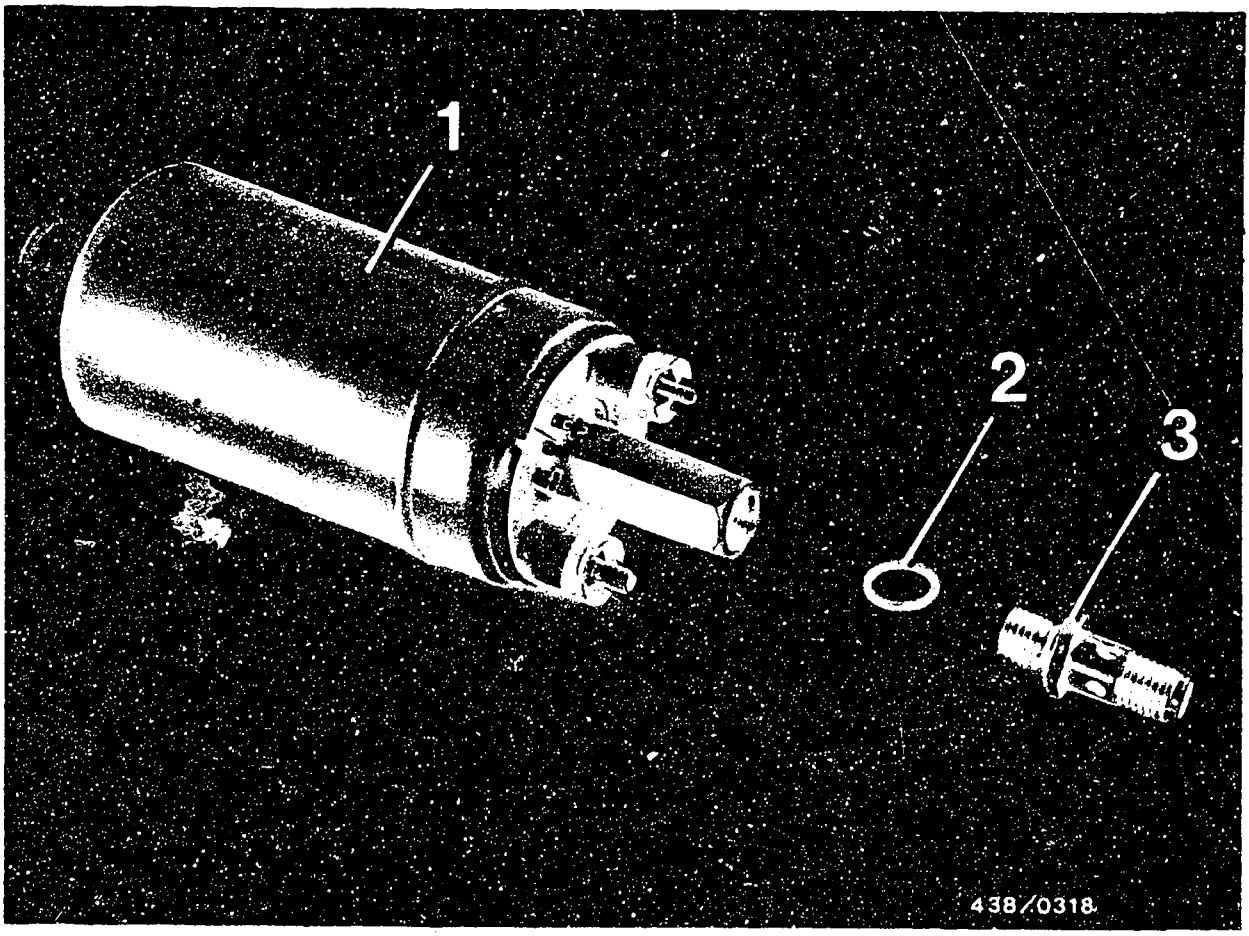
	fuel accumulator	
	0 438 170 010 (1978/79 models)	0 438 170 029 (from 1980 model)
Minimum pressure (gauge pressure) after 10 minutes:	2.0 bar (2.1 kgf/cm²)	2.7 bar (2.8 kgf/cm²)
20 minutes:	1.7 bar (1.8 kgf/cm²)	2.6 bar (2.7 kgf/cm²)



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

If the pressure drops too quickly, repeat the test with the control-pressure circuit disconnected.

Position of the valve screws:
Close the valve screw of the directional-control valve KDJE-P 100.
In the case of KDEP 1034, close valve screw 1, open valve screw 2.
If the same result is found, the leak is in the primary-pressure circuit.
If the test results are correct during the second test, the leak is in the control-pressure circuit.



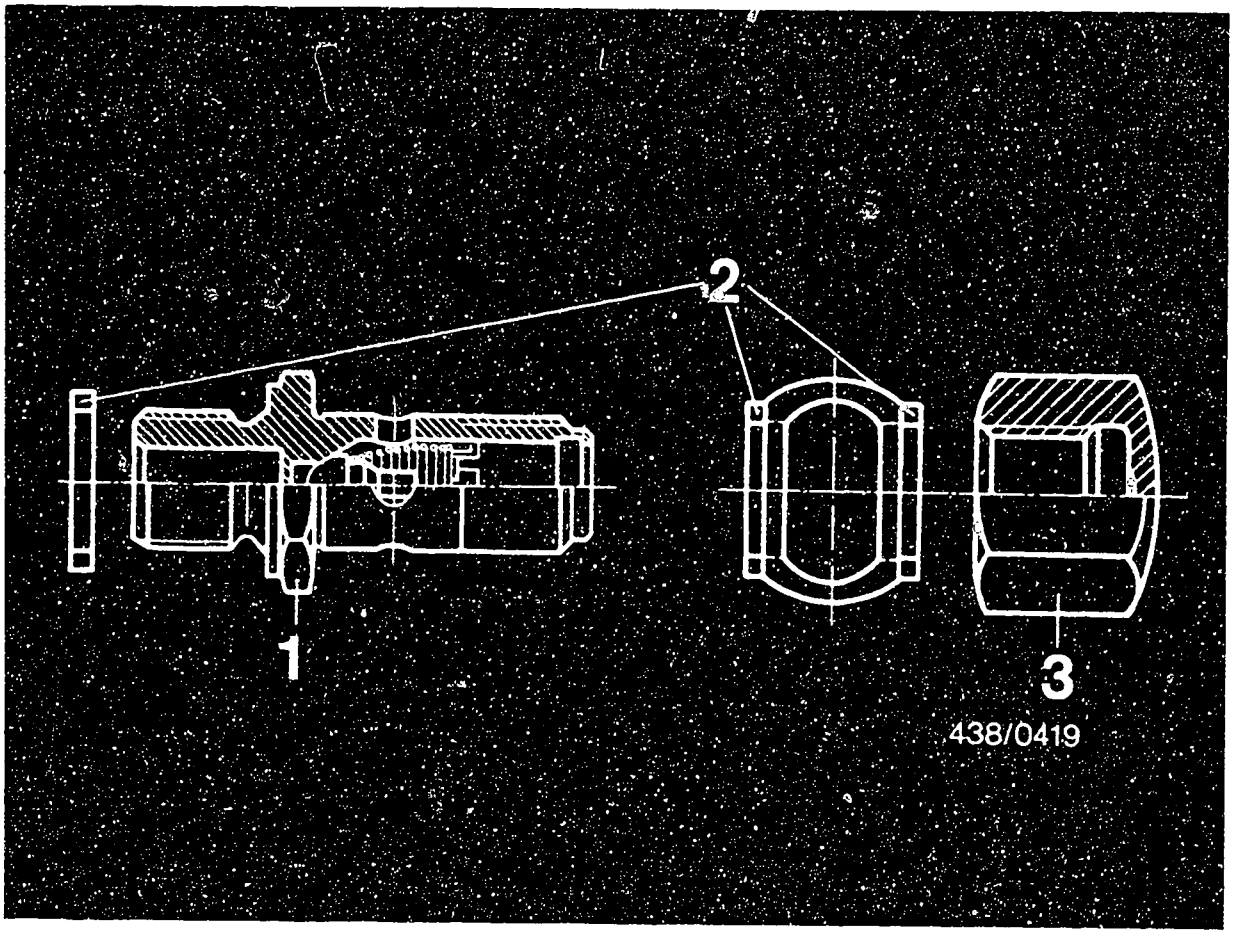
1 = Electric fuel pump
2 = Flat seal ring
3 = Tube fitting with non-return valve

16.4 Possible causes of a defect in the primary-pressure circuit:

- Non-return valve in the pressure connection piece of the electric fuel pump has a leak.

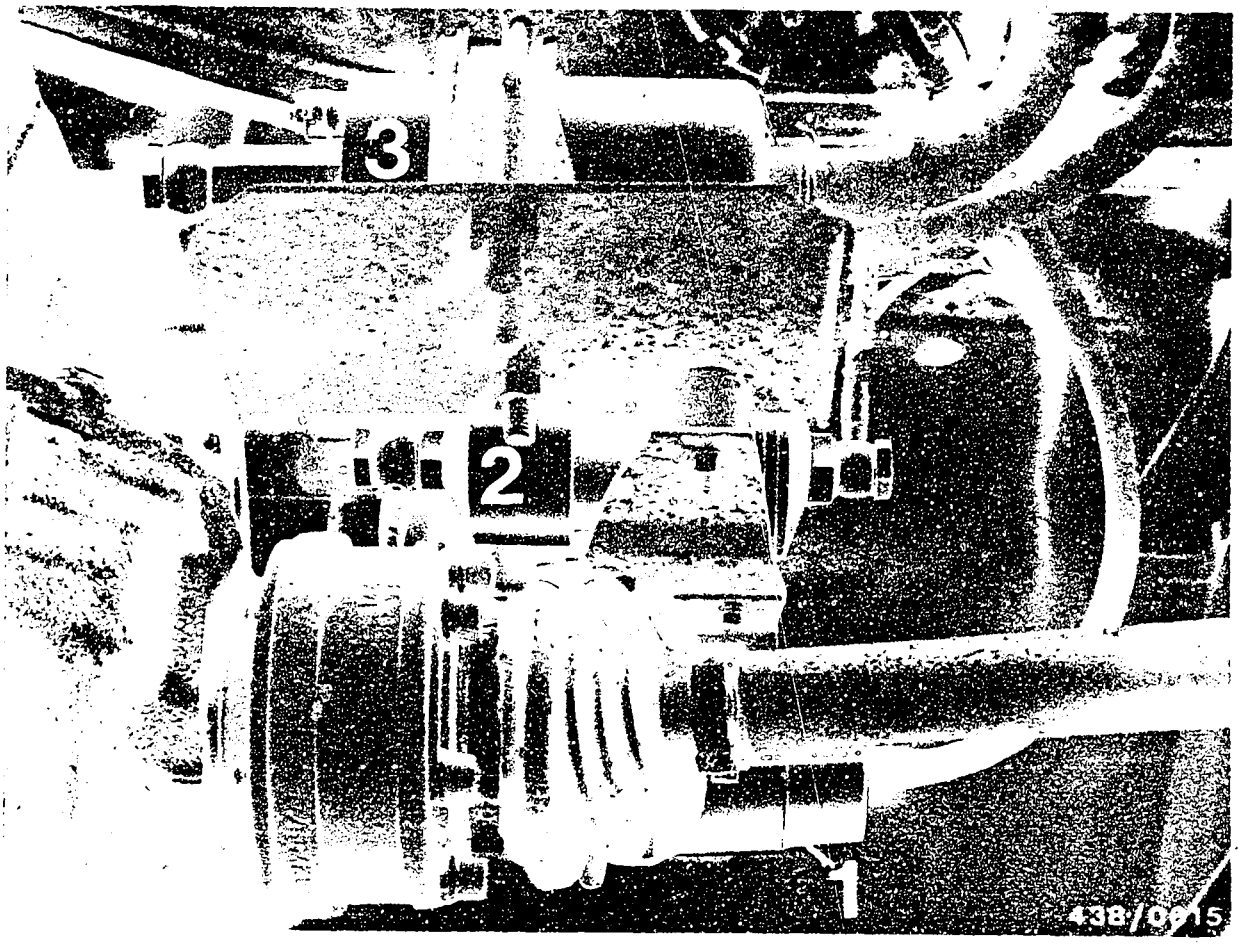
  Part No. of electric fuel pump: 0 580 254 984 and ... 975

  The non-return valve is built into the tube fitting and cannot be exchanged.



1 = Tube fitting with built-in non-return valve
2 = Flat seal rings
3 = Cap nut

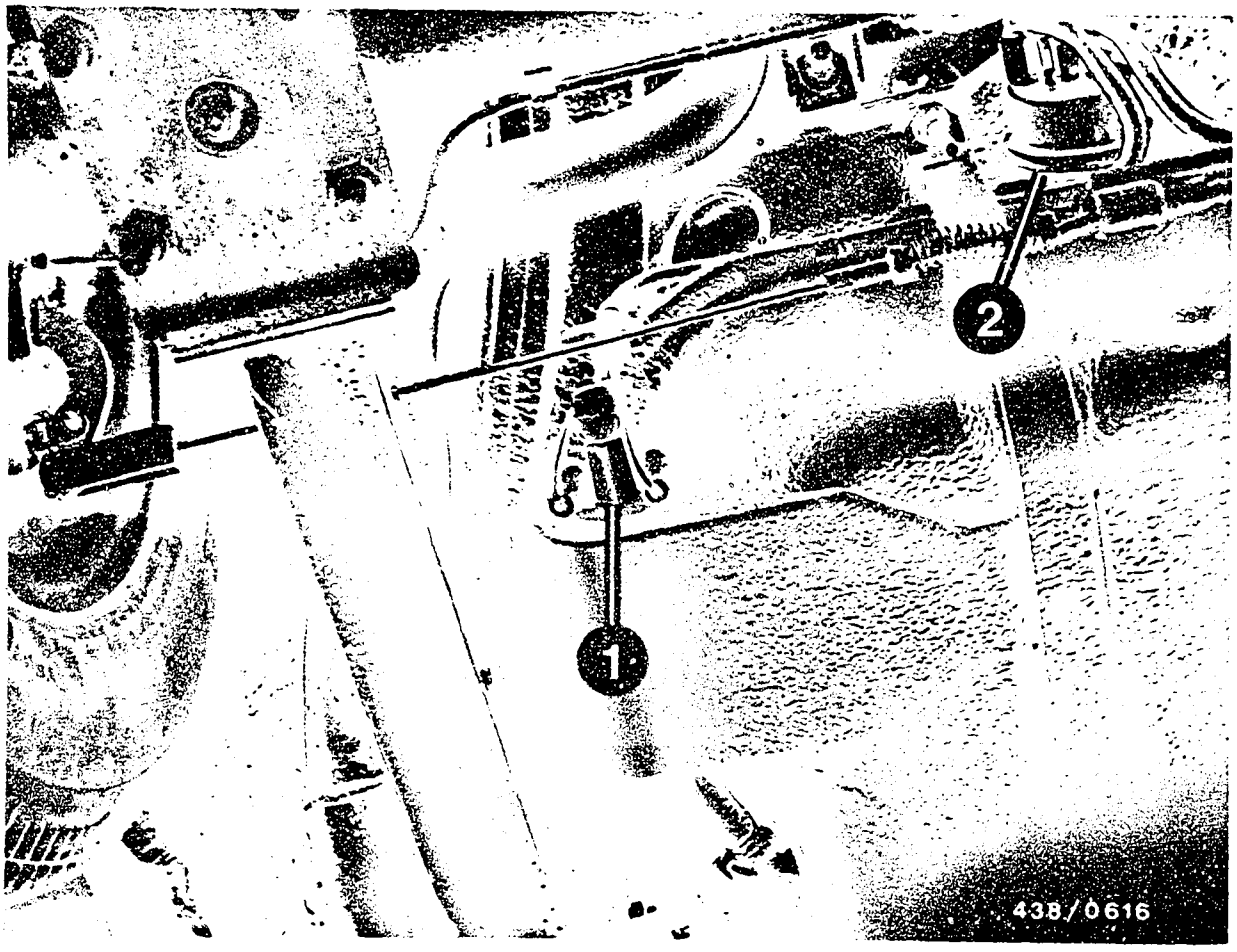
In order to avoid replacing the complete electric fuel pump if the non-return valve has a leak, a parts set with a separate non-return valve has been introduced and can be used on the above-mentioned electric fuel pump.
Part number of parts set: 1 587 010 003.



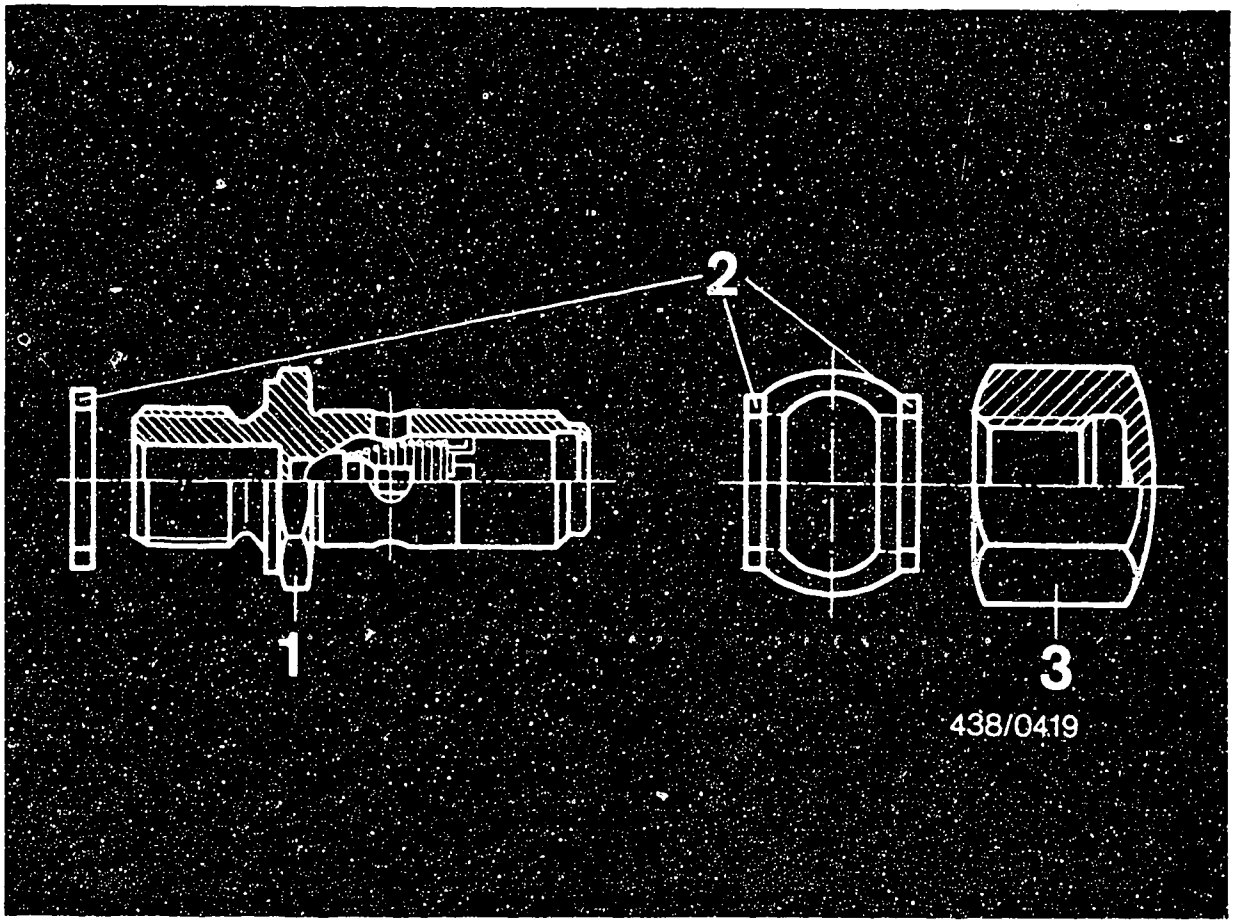
1 = Fuel accumulator
2 = Fuel filter
3 = Electric fuel pump

The new non-return valve can be installed on both vehicle models without removing the electric fuel pump.

The picture shows the installation position of the electric fuel pump on the Ford Granada (3).



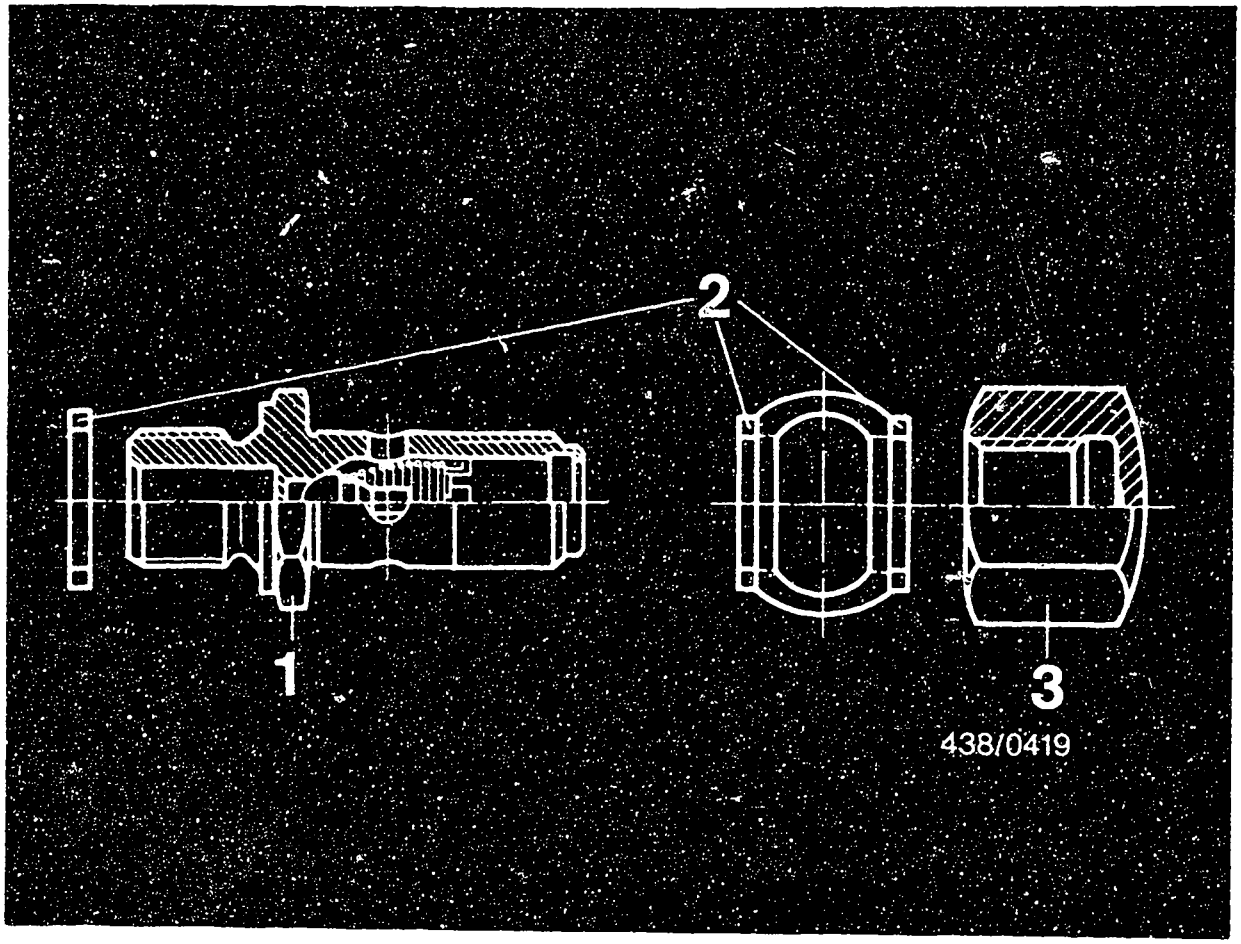
Installation position of electric fuel pump on Ford Capri (1).



1 = Tube fitting with built-in non-return valve
2 = Flat seal rings
3 = Cap nut

Installation:

Thoroughly clean the connection of the delivery line on the electric fuel pump.
Pinch off the intake hose (between fuel tank and electric fuel pump) (e.g. hose clamper W 157 from Matra Co.). Unscrew the delivery line, catching any escaping fuel.
The defective original non-return valve remains in the electric fuel pump.

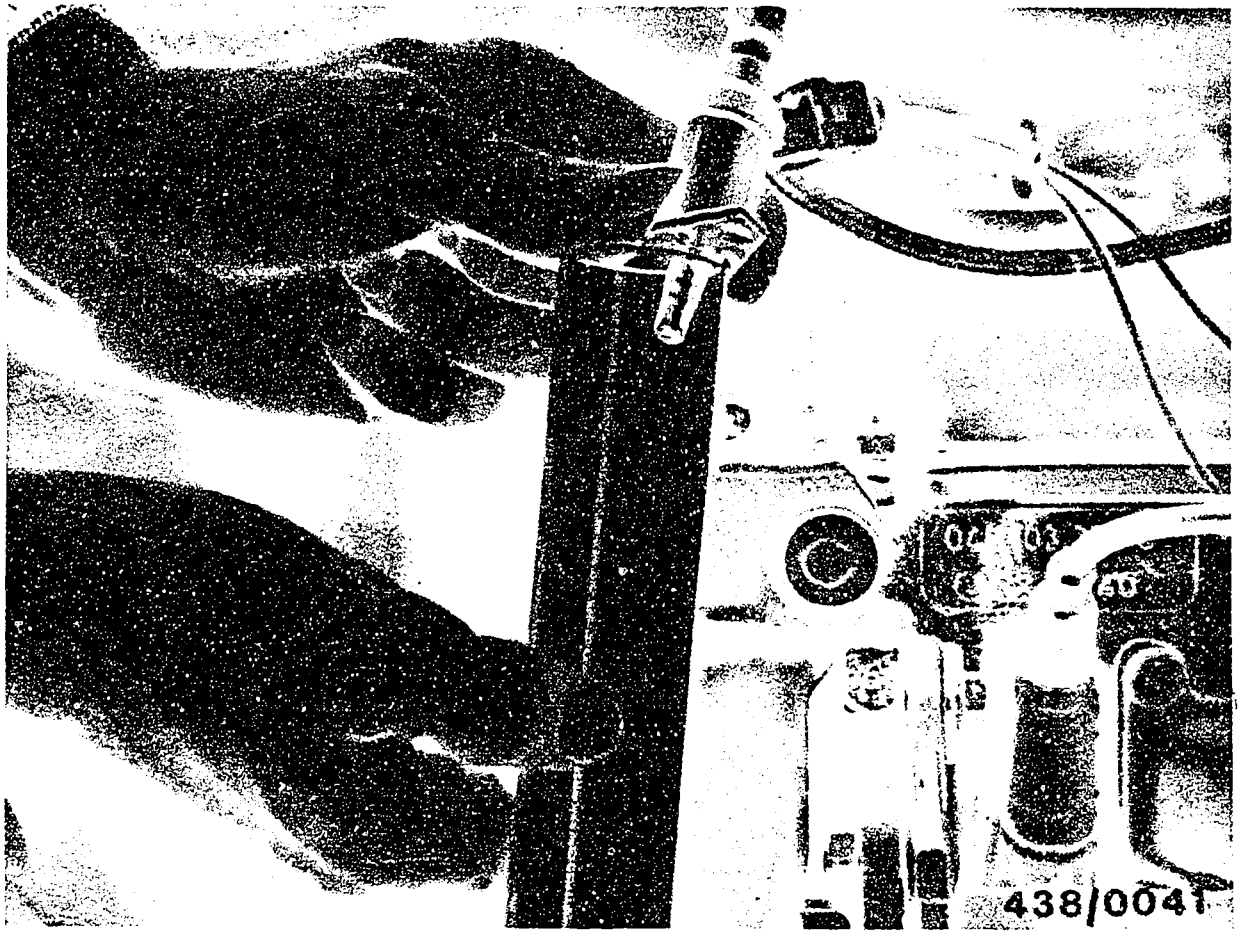


Screw the tube fitting of the parts set (short end) with a thick flat seal ring into the delivery fitting and tighten to a torque of 17...25 Nm.

While doing this, hold the hexagonal section of the delivery fitting with a wrench.

Fit a thin flat seal ring, the inlet union of the fuel line and another flat seal ring onto the long end of the tube fitting and tighten with the hexagon cap nut. Remove the hose clamper from the intake hose.

Check the connections for leaks with the electric fuel pump operating.



- The cold-start valve has a leak.

Remove cold-start valve. The hose line remains connected.

Hold start valve in a suitable container (e.g. graduate). Switch on the electric fuel pump by bridging the electrical safety circuit.

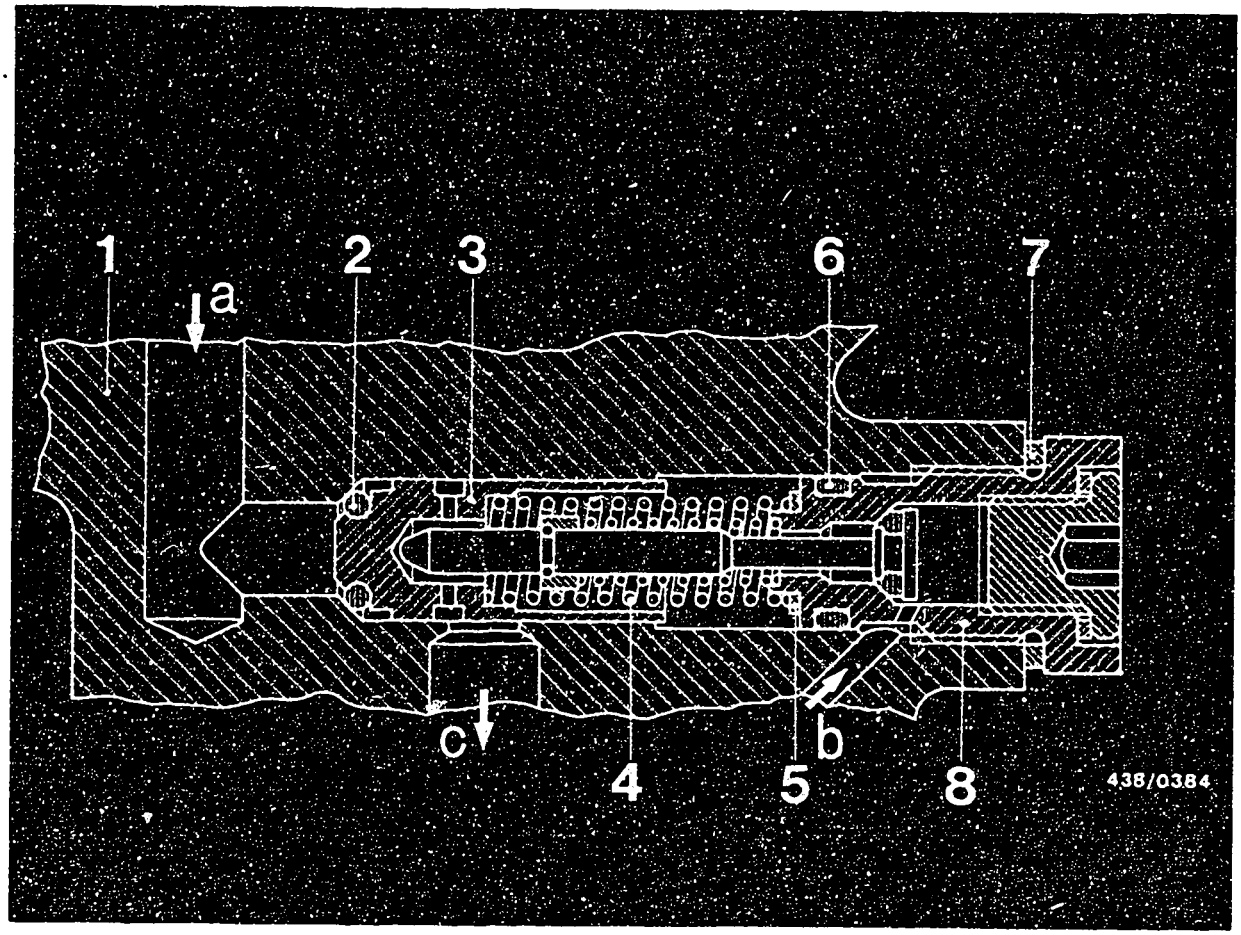
Dry off the nozzle of the cold-start valve.

No drops must fall from the nozzle of the start valve within the next minute. Even when shaken and knocked, the start valve must not leak.

Then switch off the electric fuel pump again.

Replace the start valve if leaky and finally carry out the idle adjustment with the engine at normal operating temperature.

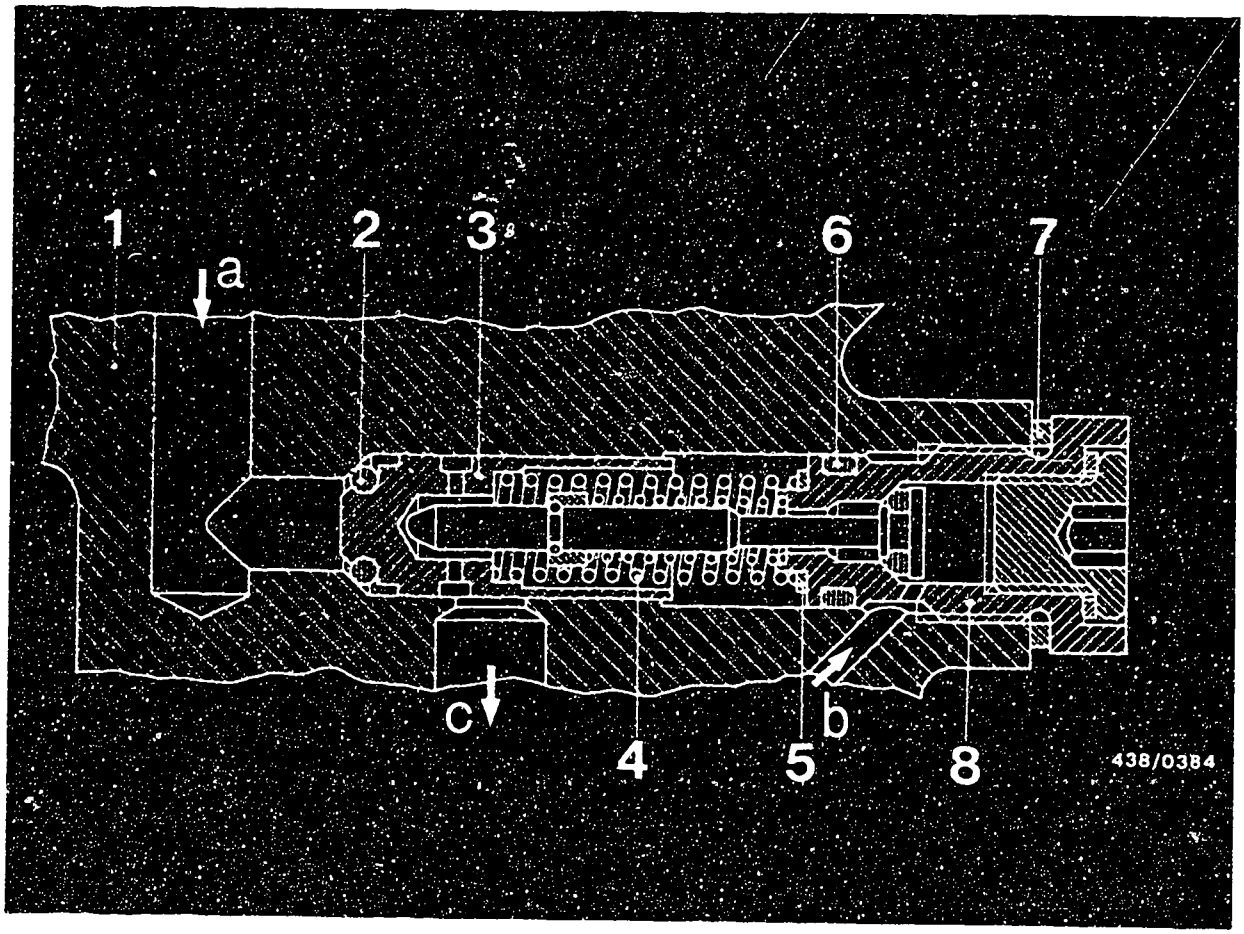
For idle adjustment see Coordinates G 4.



a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug

- O-ring in the control piston of the primary-pressure regulator has a leak.

  Replace O-ring.
  Clean the fuel distributor in the region of the primary-pressure regulator.



Screw out the large screw plug (8) with the complete push valve. Also remove shims (5), control spring (4) and control piston (3).

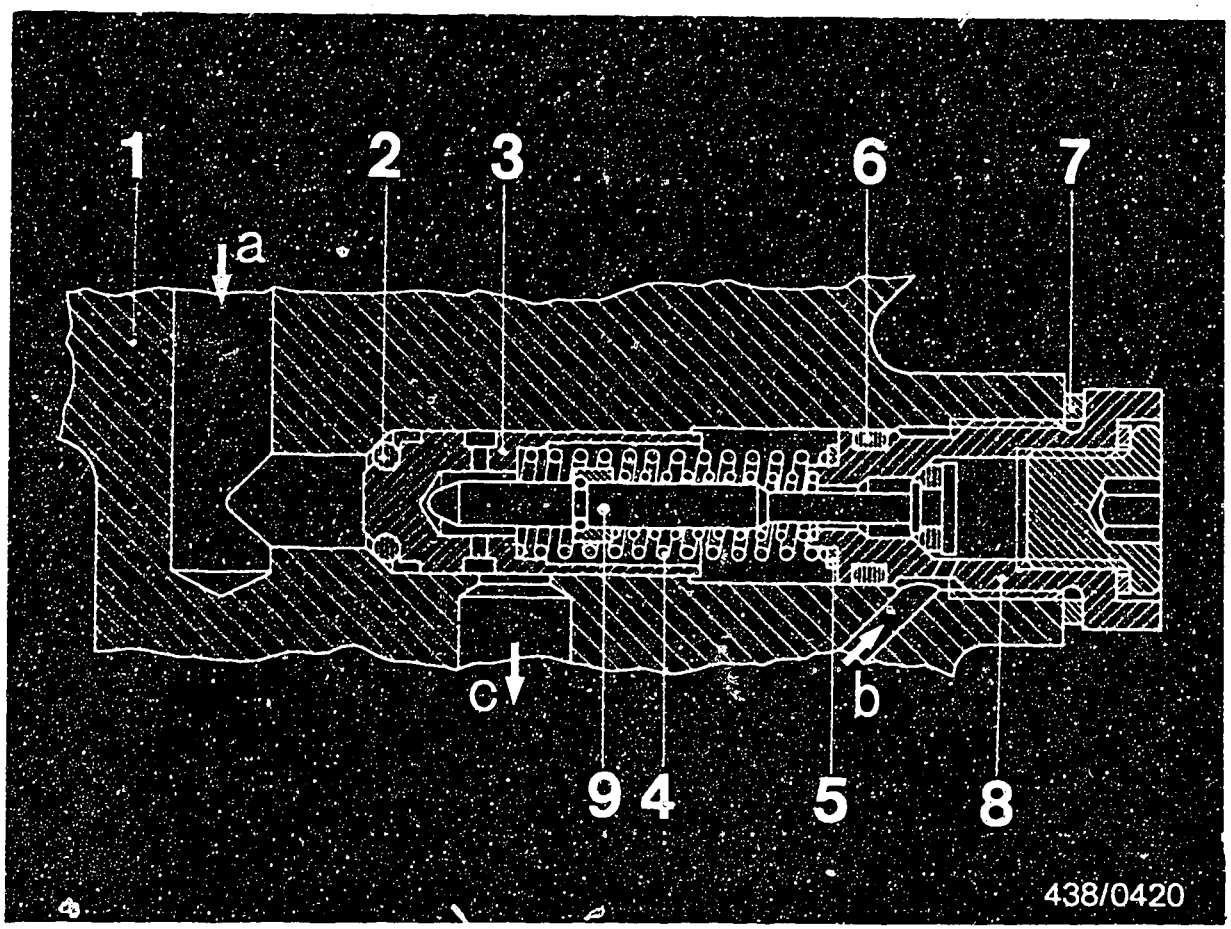
Change O-ring (Item 2). Fit control piston and control spring.

Screw in screw plug with complete push valve and with shims (as when removed) and new seal rings (6 and 7).

Finally, check the primary pressure and, if necessary, adjust by changing the shims (5).

Part no. of fuel distributor	Specifications for primary pressure*
0 438 100 025 (78/79 model)	Checking value 4.5...5.2 bar (4.6...5.3kgf/cm^2) Setting value 4.7...4.9 bar (4.8...5.0kgf/cm^2)
Fuel distributor 0 438 100 080 (from 80 model)	Checking value 4.7...5.4 bar (4.8...5.5kgf/cm^2) Setting value 4.9...5.1 bar (5.0...5.2kgf/cm^2)

*Pressures in the test-specification table are given in bar (gauge pressure) and/or in kgf/cm^2 (gauge pressure).

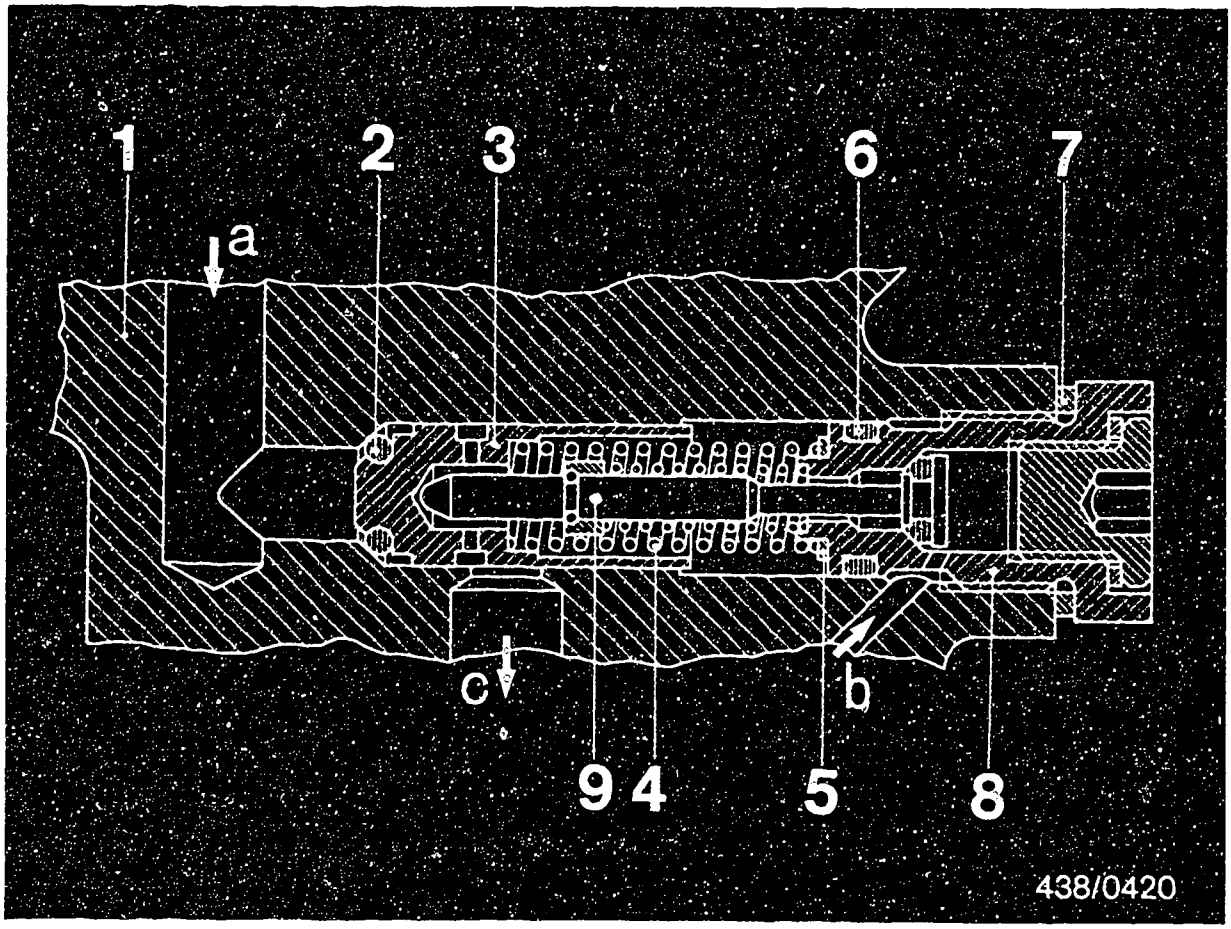


a	=	Primary pressure	4	=	Control spring
b	=	From warm-up regulator	5	=	Shim(s)
c	=	Fuel return	6	=	O-ring
1	=	Fuel-distributor housing	7	=	Flat seal ring
2	=	O-ring	8	=	Screw plug
3	=	Control piston	9	=	Push valve

16.5 Possible causes of a defect in the control-pressure circuit:

- Push valve (9) in the primary-pressure regulator leaking.

  Replace push valve.



a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug
9 = Push valve

Clean the fuel distributor in the region of the primary-pressure regulator. Screw out the large screw plug (8) together with the complete push valve. Pay attention to control spring (4) and shims (5).

Screw in new push valve using the same number of shims (5), new O-ring (6) and flat seal ring (7).

Then check the primary pressure again and, if necessary, adjust by changing the shims (5).

Test specifications and settings for primary pressure*

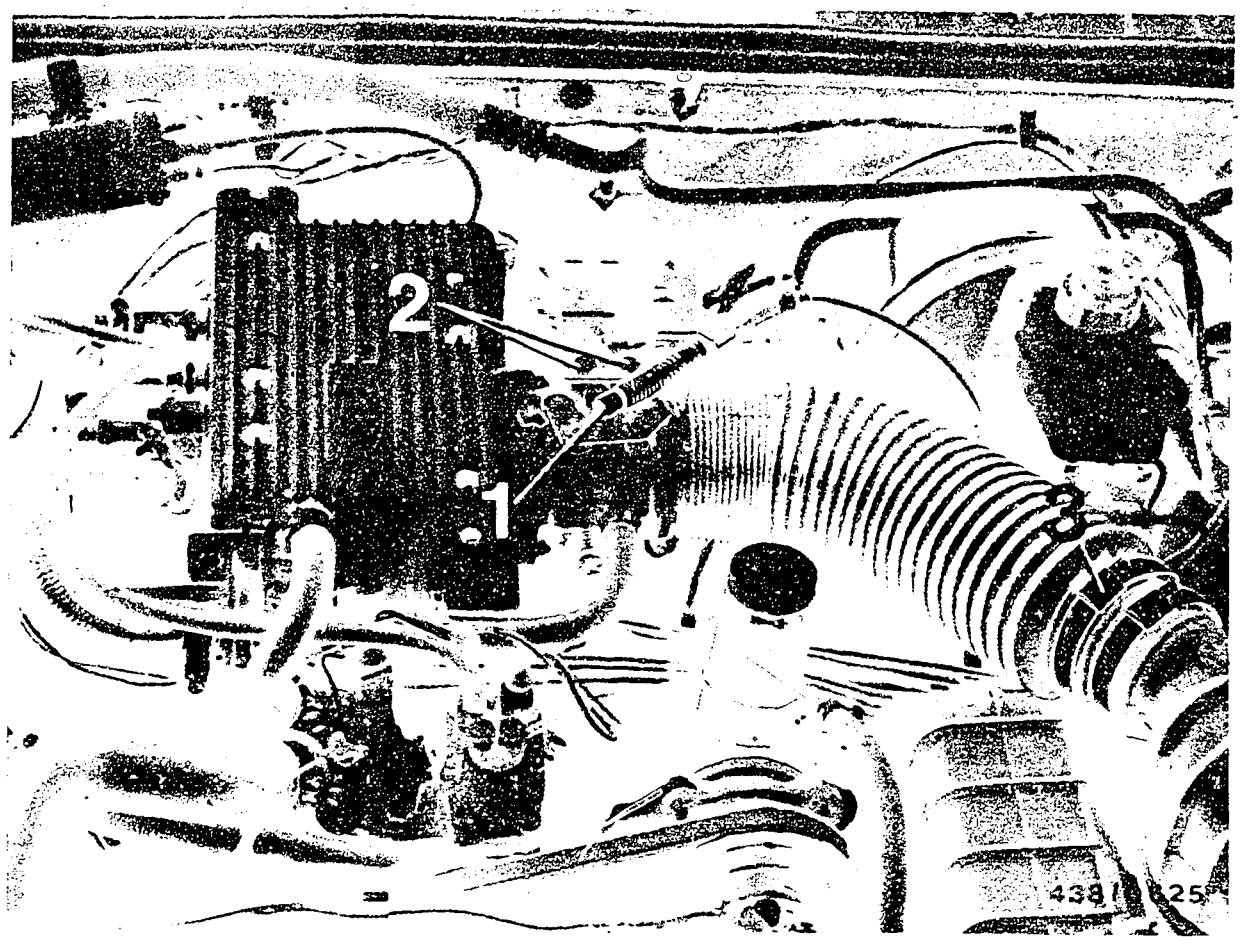
Part no. of fuel distributor: 0 438 100 025 (79/80 model)

Checking value: 4.5...5.2 bar (4.6...5.3 kgf/cm^2)
Setting value: 4.7...4.9 bar (4.8...5.0 kgf/cm^2)

Part no. of fuel distributor: 0 438 100 080 (from 80 model)

Checking value: 4.7...5.4 bar (4.8...5.5 kgf/cm^2)
Setting value: 4.9...5.1 bar (5.0...5.2 kgf/cm^2)

*Pressures in the test specification table are given in bar (gauge pressure) and/or in kgf/cm^2 (gauge pressure).



17. Testing the injection valves

17.1 Remove the injection valves for testing:

In order to make the injection valves accessible, remove the complete air chamber as follows:

Remove the throttle-cable stop sleeve from the throttle-valve assembly and unhook the throttle cable (1). Remove the throttle-cable holder (2 fastening screws) (2).

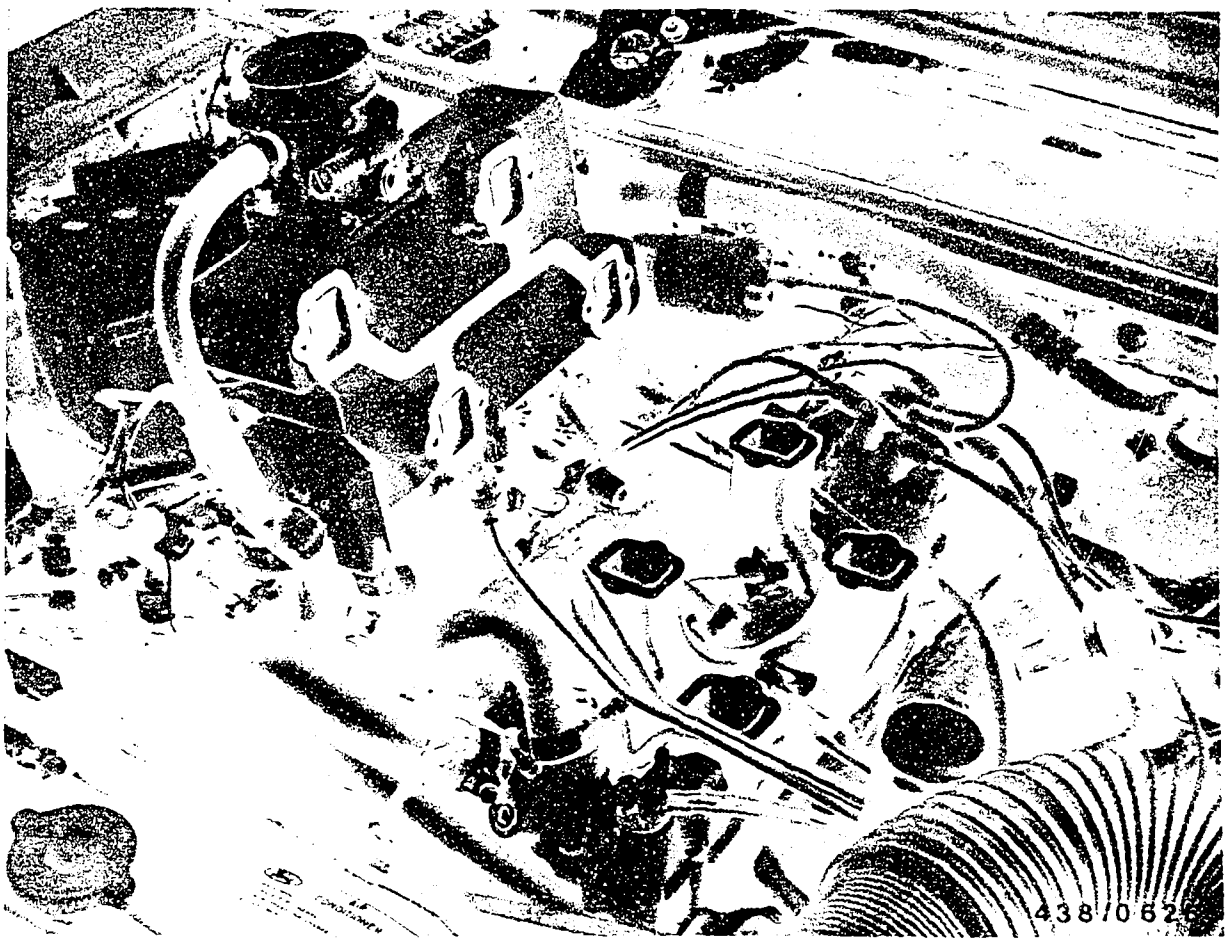
Loosen the air hose on the clamping band (3) and on the throttle-valve assembly and remove.

Unscrew and remove the following lines and hoses:

Plugs on warm-up regulator, auxiliary-air device, thermo-time switch and start valve.

Fuel line on start valve.

Vacuum hose on warm-up regulator.



Unscrew the 8 fastening screws of the air chamber. Lift off the air chamber, raise up at the side and fix in this position, possibly using a wire.

For the complete removal of the injection valves, first of all unscrew the fuel-injection lines, making sure to hold the fixed hexagonal section with a wrench.

Installation

Provide the injection valves with new O-rings and install.

Clean the joint surfaces on the intake pipes and on the air chamber and install the air chamber with a new gasket. Tightening torque for the 8 fastening screws: 7...10 Nm.

Re-fasten all connection lines.
Fit the throttle-cable holder on the throttle-valve assembly and hook in the throttle cable.

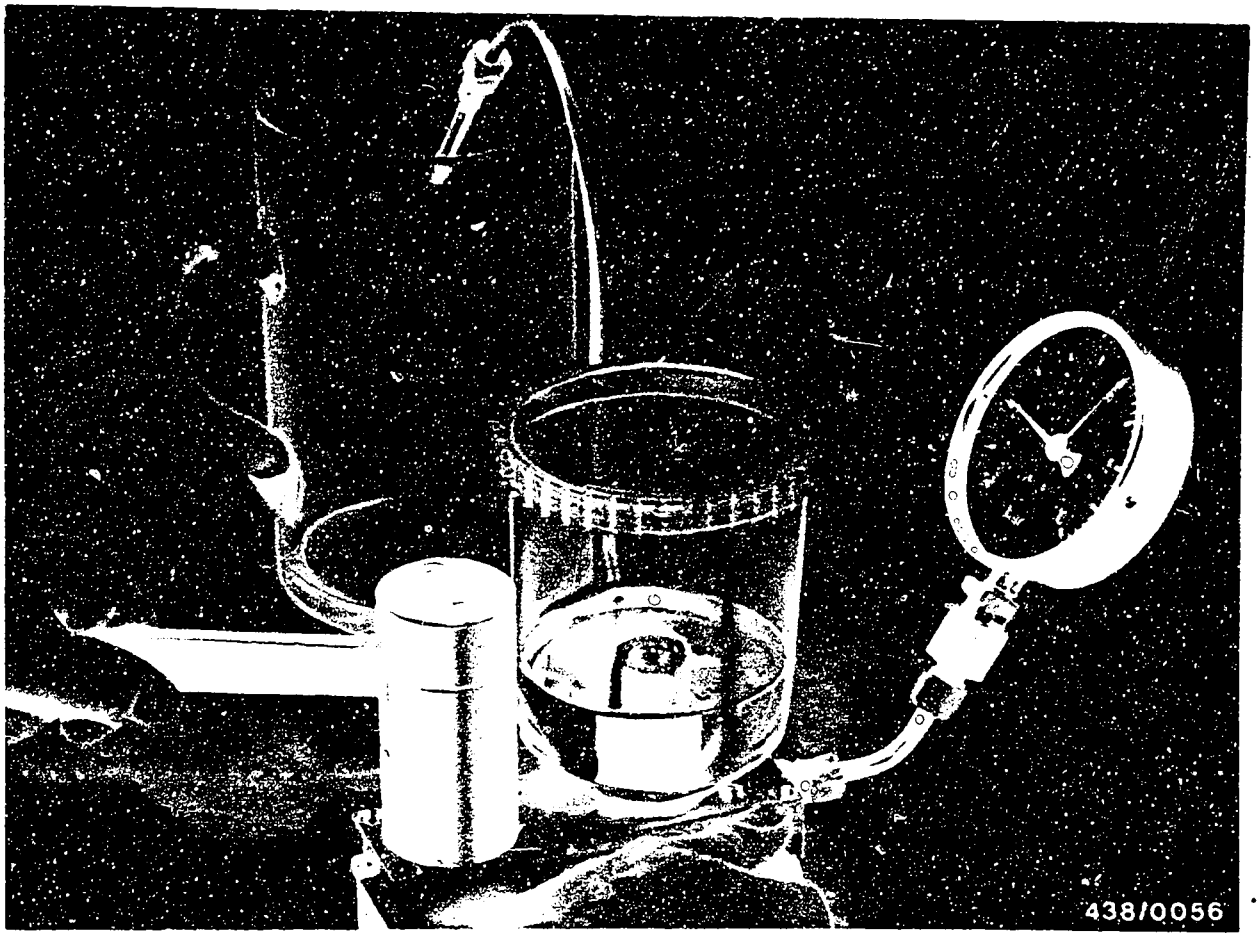
17.2 Test equipment and test media

The following testing specification refers to valve testers KDJE-P 400 (previously KDEP 7452) and 0 681 200 700.

Observe the test-media specification!

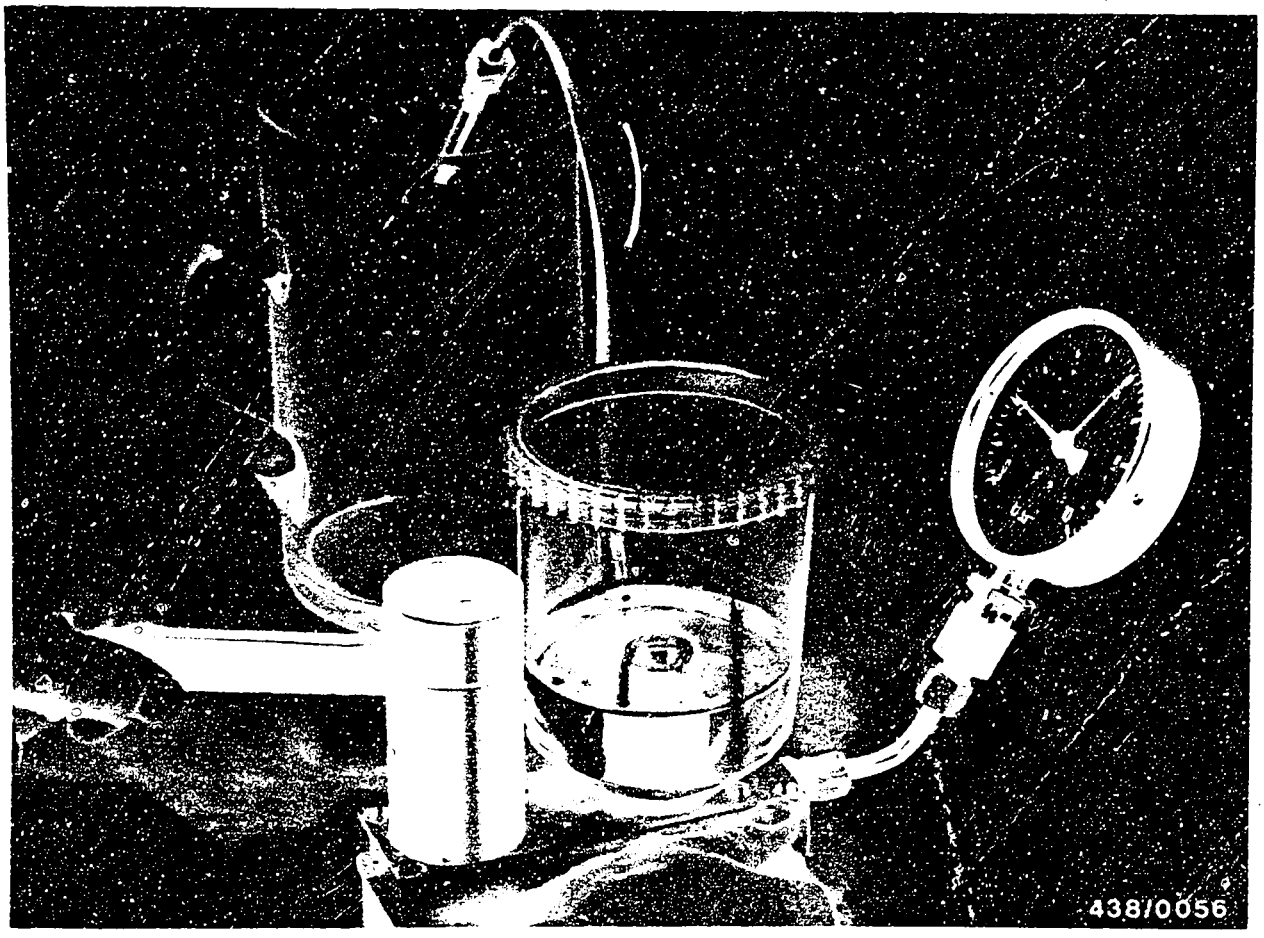
Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral Spirits 135)
or
Bosch Part No. VS 14 942 CH
Former Part No. 5 973 340 650
The calibrating fluid can be obtained in 5 l metal cans from the following supplier:
Firma
Oskar Gnamm GmbH & Co
D-7531 Kämpfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids. Even with calibrating fluid, be sure to observe the local official regulations.



17.3 Connect the injection valve to the tester:

Connect the injection valve to the test pressure line using the double threaded fitting No. 2 433 356 045 belonging to the tester.
With the union nut still open, bleed the pressure line by operating the lever several times.
Then tighten the union nut.

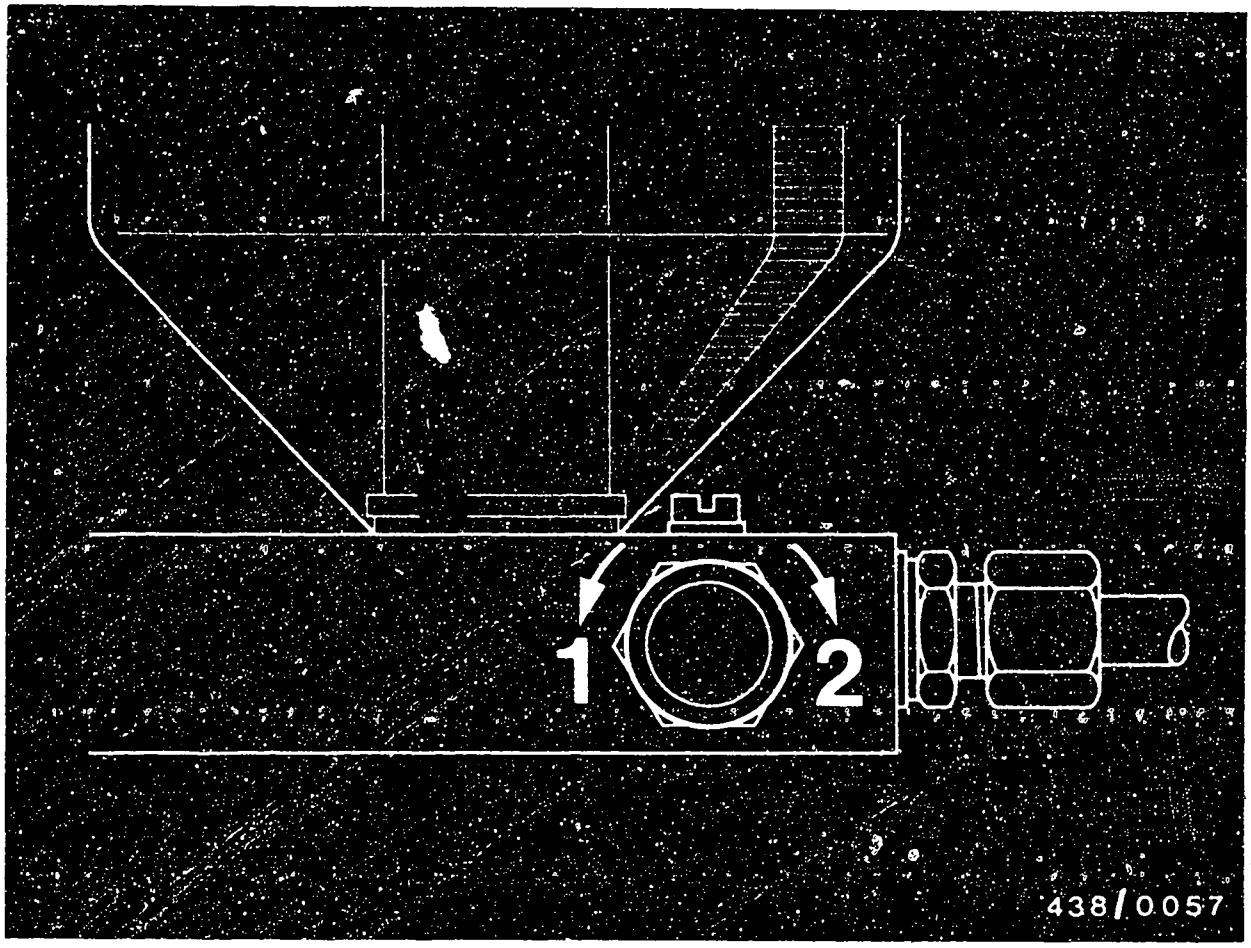


17.4 Checking for dirt

Move the hand lever slowly (about 2 seconds per stroke) back and forth with the stopcock on the pressure gauge open. If the pressure does not build up to 1...1.5 bar gauge pressure, the injection valve has a bad leak (caused, for example, by dirt stuck in it).

You can try to flush the injection valve clear by moving the lever back and forth several times strongly.

If this attempt is successful, continue the test. If it is not possible to flush the valve clear, replace it.

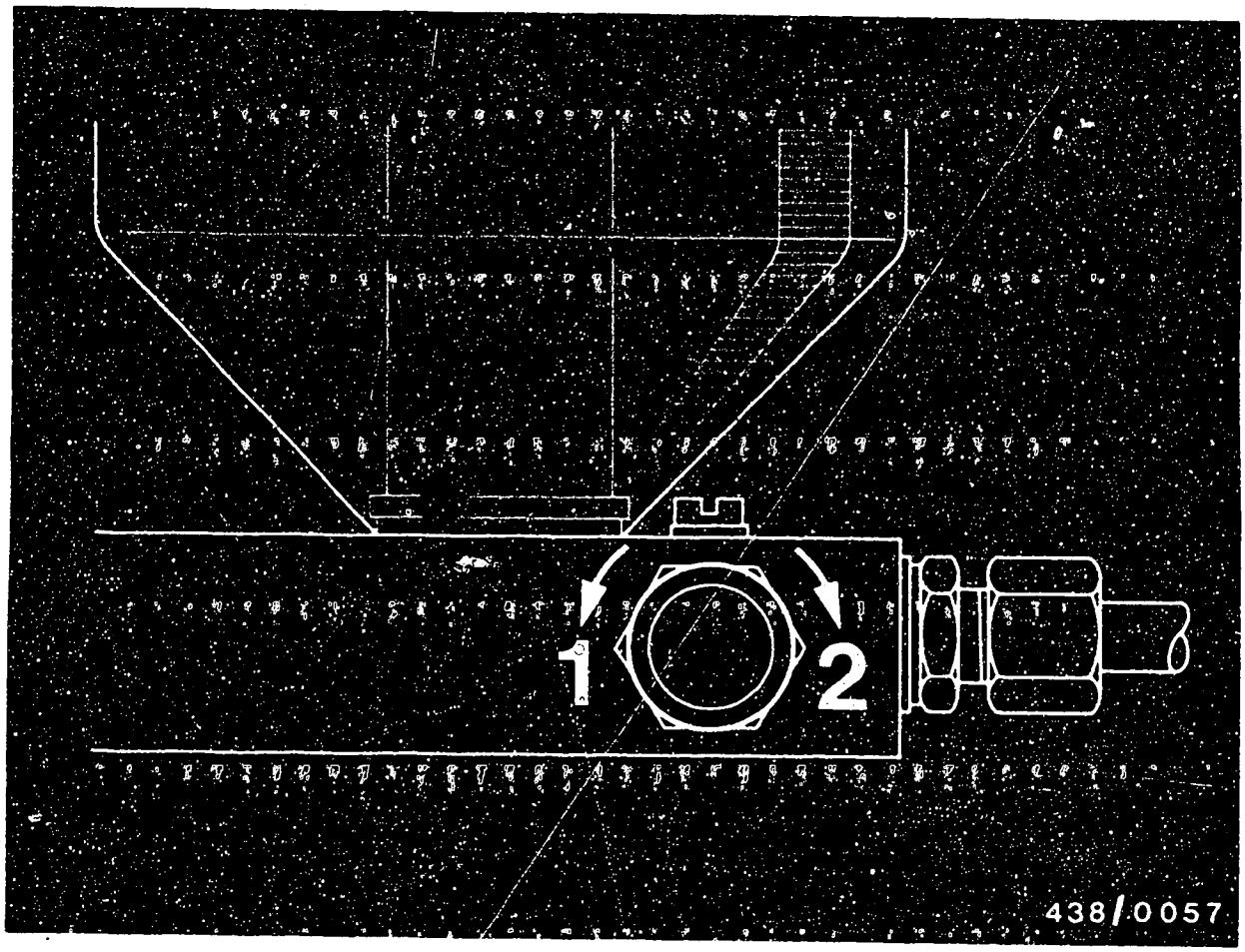


1 = Open 2 = Close

17.5 Testing the opening pressure

Injection valve Part No.	Test specifications - opening pressure (gauge pressure)
0 437 502 014 (78/79 models)	2.7...3.8 bar (2.8...3.9 kgf/cm²)
0 437 502 019 (from 1980 model)	3.0...4.1 bar (3.1...4.2 kgf/cm²)

With the stopcock closed, flush the valve out and bleed it with several rapid movements of the lever.

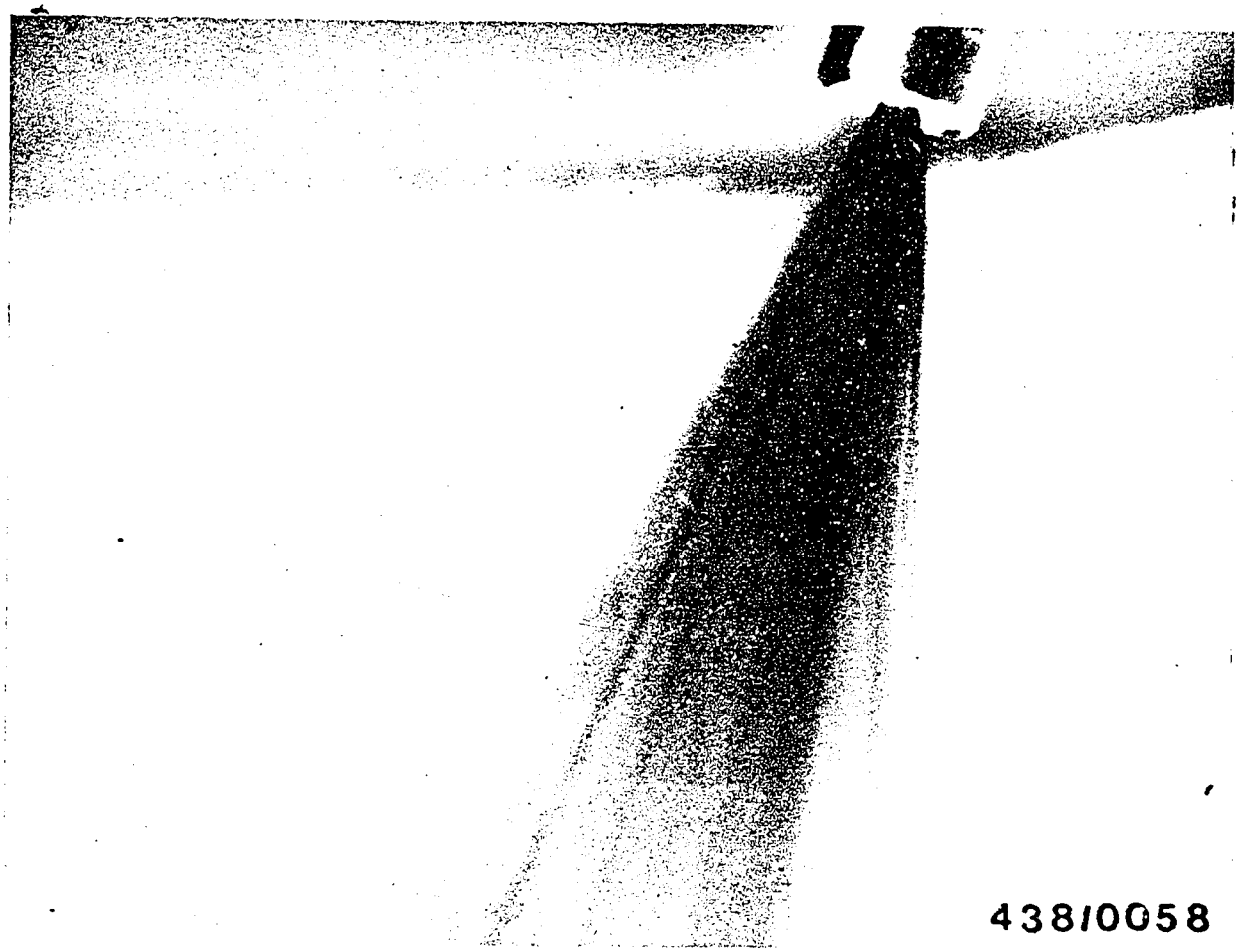


1 = Open 2 = Closed

Open the stopcock and test the opening pressure while moving the lever slowly (approx. 2 s/stroke).
If the opening pressure is outside tolerance, replace the injection valve. It is also possible to replace individual valves within a set.

17.6 Leak test

Open the stop cock and slowly increase the pressure up to 0.5 bar below the previously established opening pressure (but not below 2.3 bar gauge pressure) and hold. Within the next 15 seconds no drop must fall from the valve.

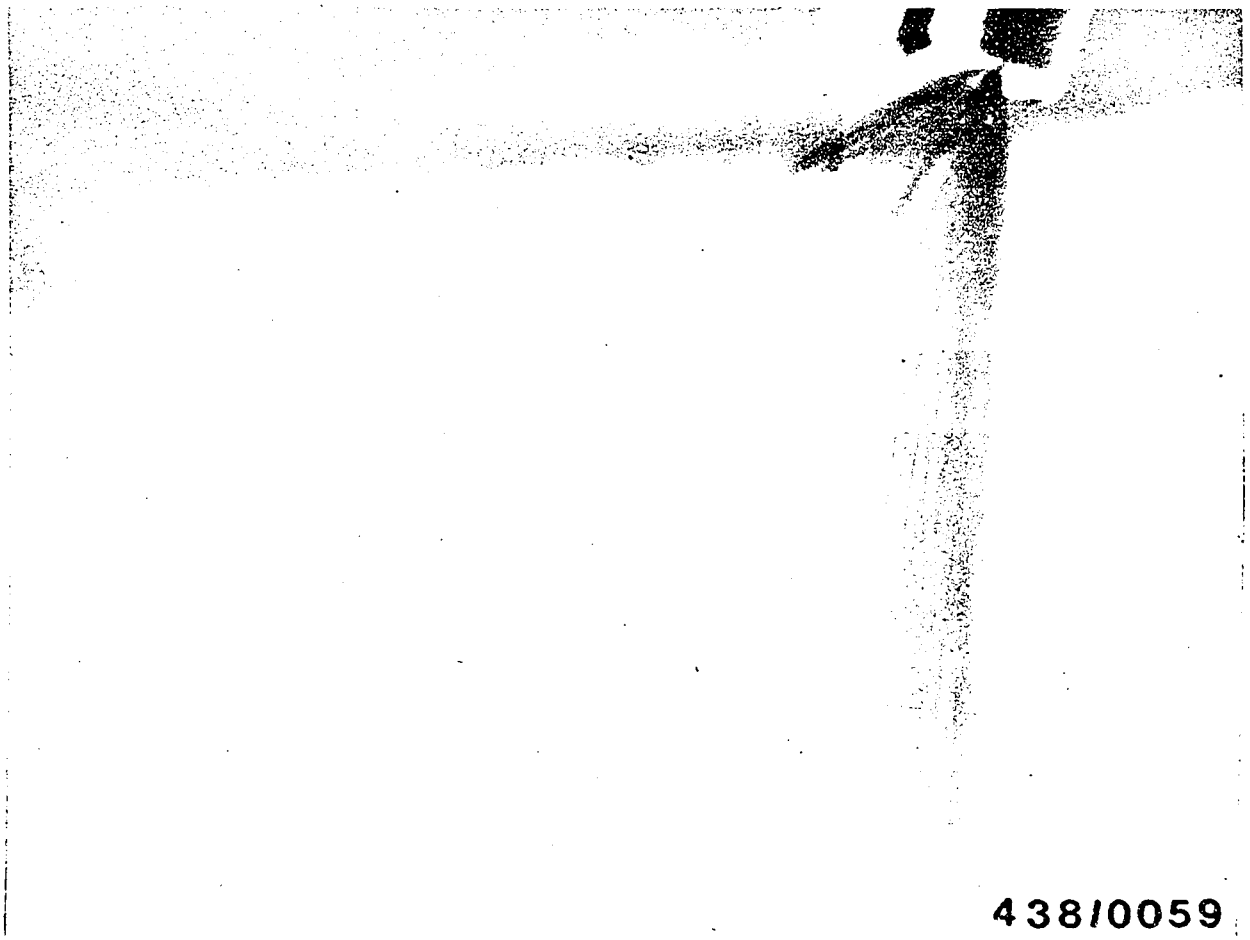


43810058

17.7 Chatter test, evaluation of spray

Move the lever back and forth at about 1 stroke per second. As this is done, the valve must chatter. No drops of fuel must form at the mouth of the valve. The valve must not produce a "cord spray". Formation of a single-sided, atomized spray within an overall spray angle of about 35^{o} is permissible (see example given in illustrations).

Illustration shows good spray formation.



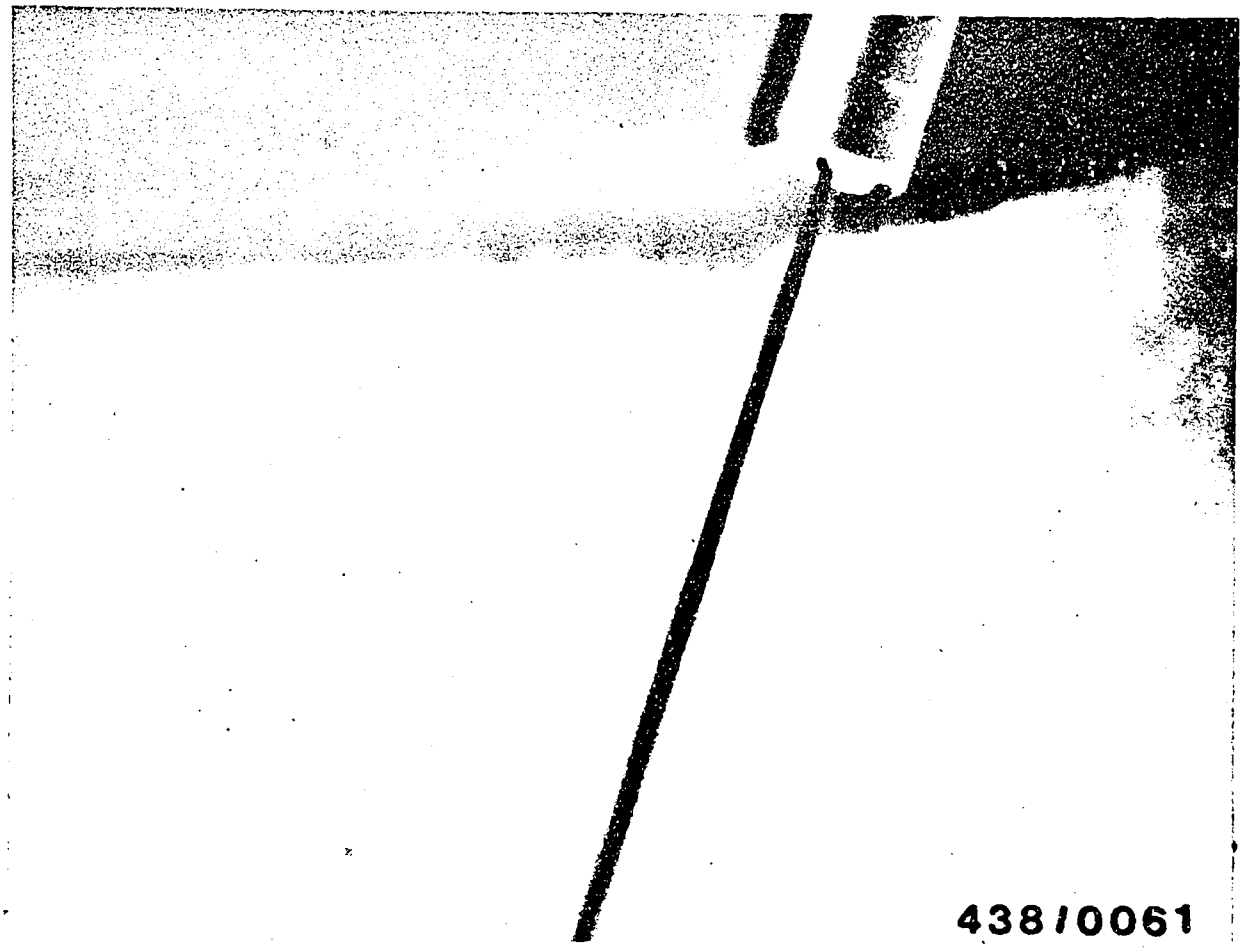
438/0059

Illustration shows single-sided but nevertheless good spray formation.

438/0060

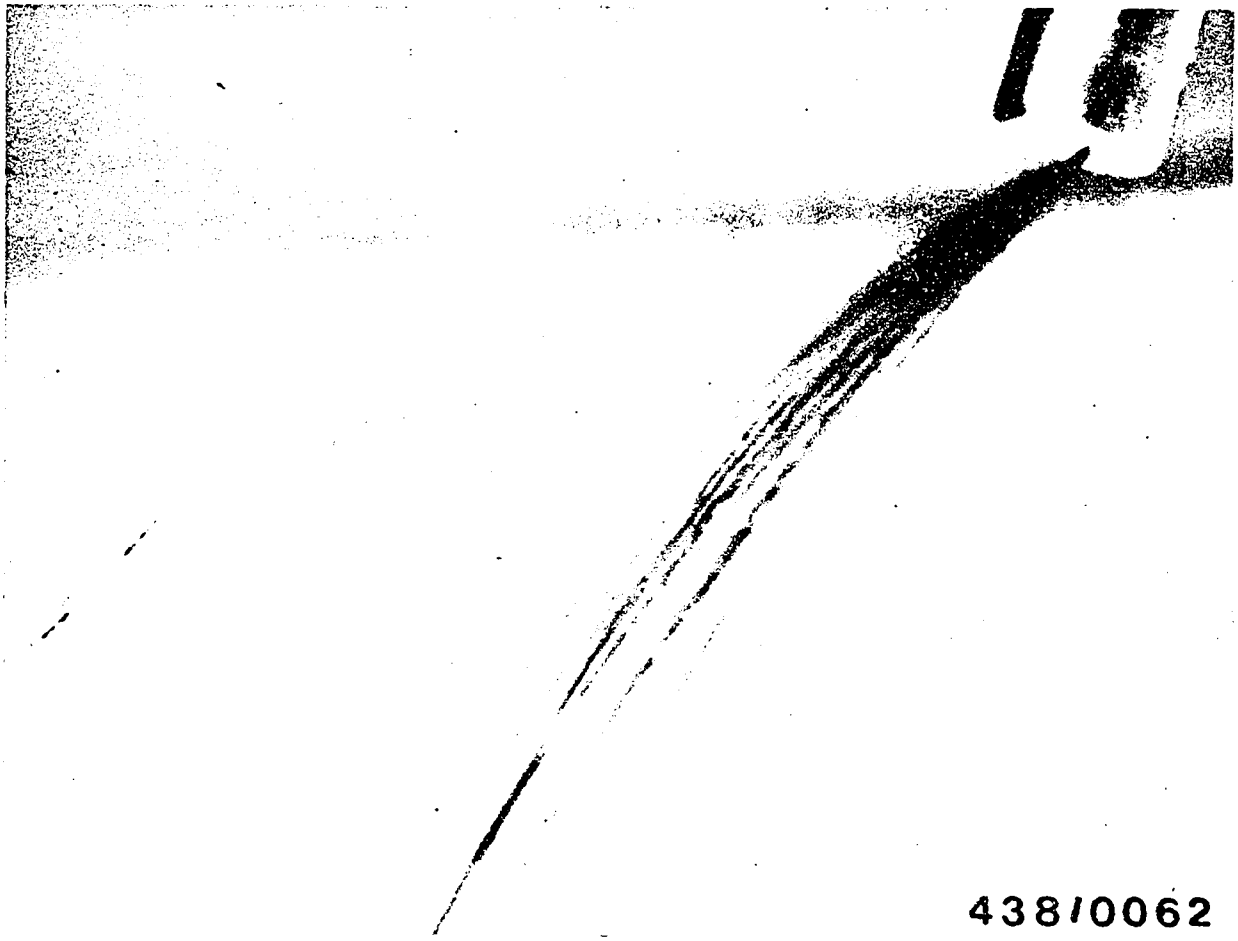
Poor spray formation; replace injection valves.

Illustration shows drop formation.



Poor spray formation; replace injection valves.

Illustration shows "cord" spray.



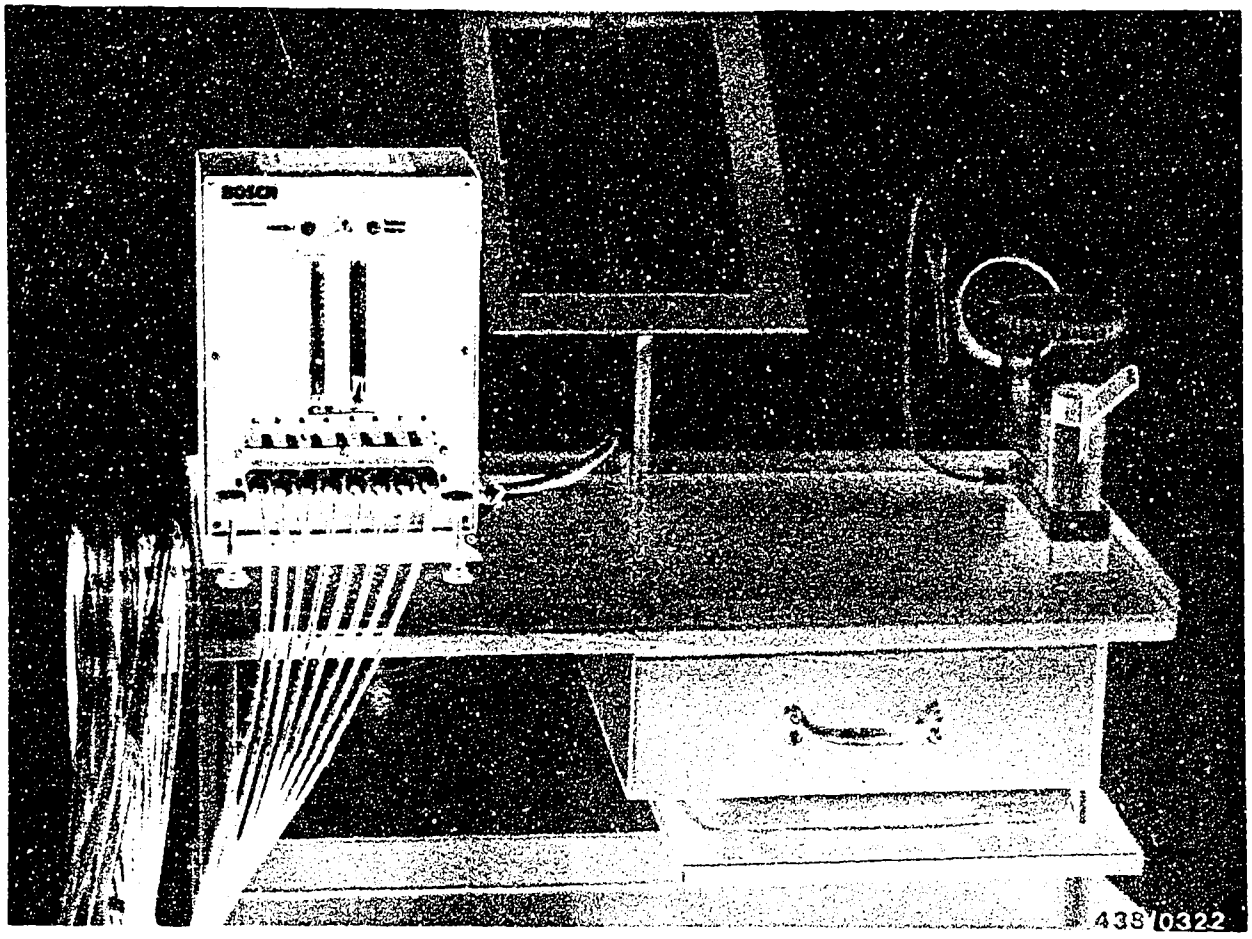
438/0062

Poor spray formation; replace injection valves.

Illustration shows "spray in strands".

If defective injection valves have been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates G4.

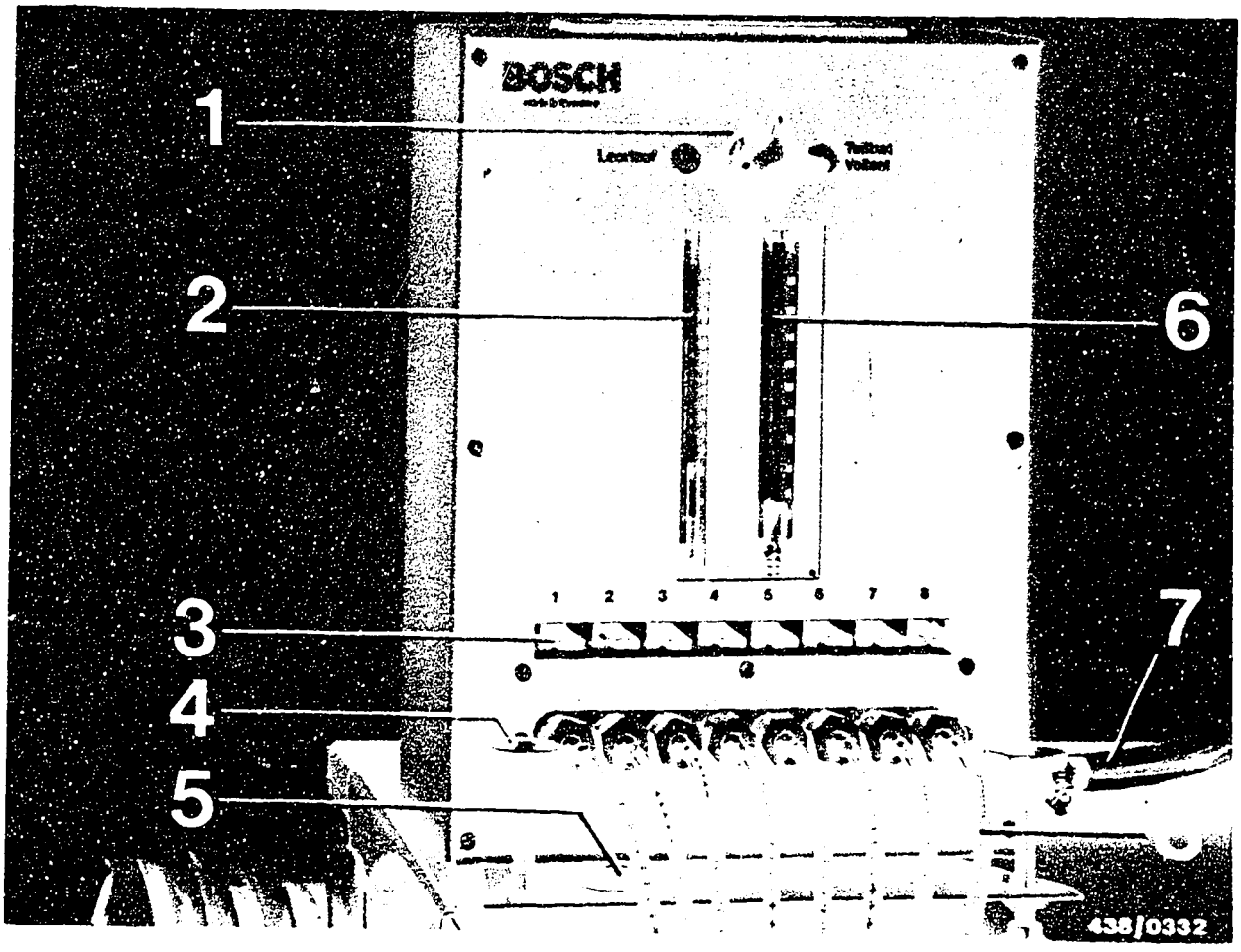


18. Comparative measurement of fuel delivery of fuel distributor outlets.

This test is carried out using the tester for delivered quantity comparison KDJE-P 200 (previously KDJE 7451).

18.1 Application

By means of comparative measurements, the differences in the amounts of fuel delivered from the individual outlets on the fuel distributor are determined.
The tester is designed so that the test can be made on the vehicle without having to remove the fuel distributor.
Since the test is made with the original injection valves, the operator can recognize at the same time whether delivered-quantity scatter, if it occurs, is caused by the fuel distributor or by the injection valves.



1 = 3-way cock
2 = Small rotameter tube
3 = Keyboard for 8-way valve
4 = Adjusting screw for setting up
5 = Spirit level
6 = Large rotameter tube
7 = Return hose
8 = Polyamide hose (test lines)

18.2 Construction

The tester is designed for use with all engines, up to 8 cylinders, equipped with K-Jetronic.

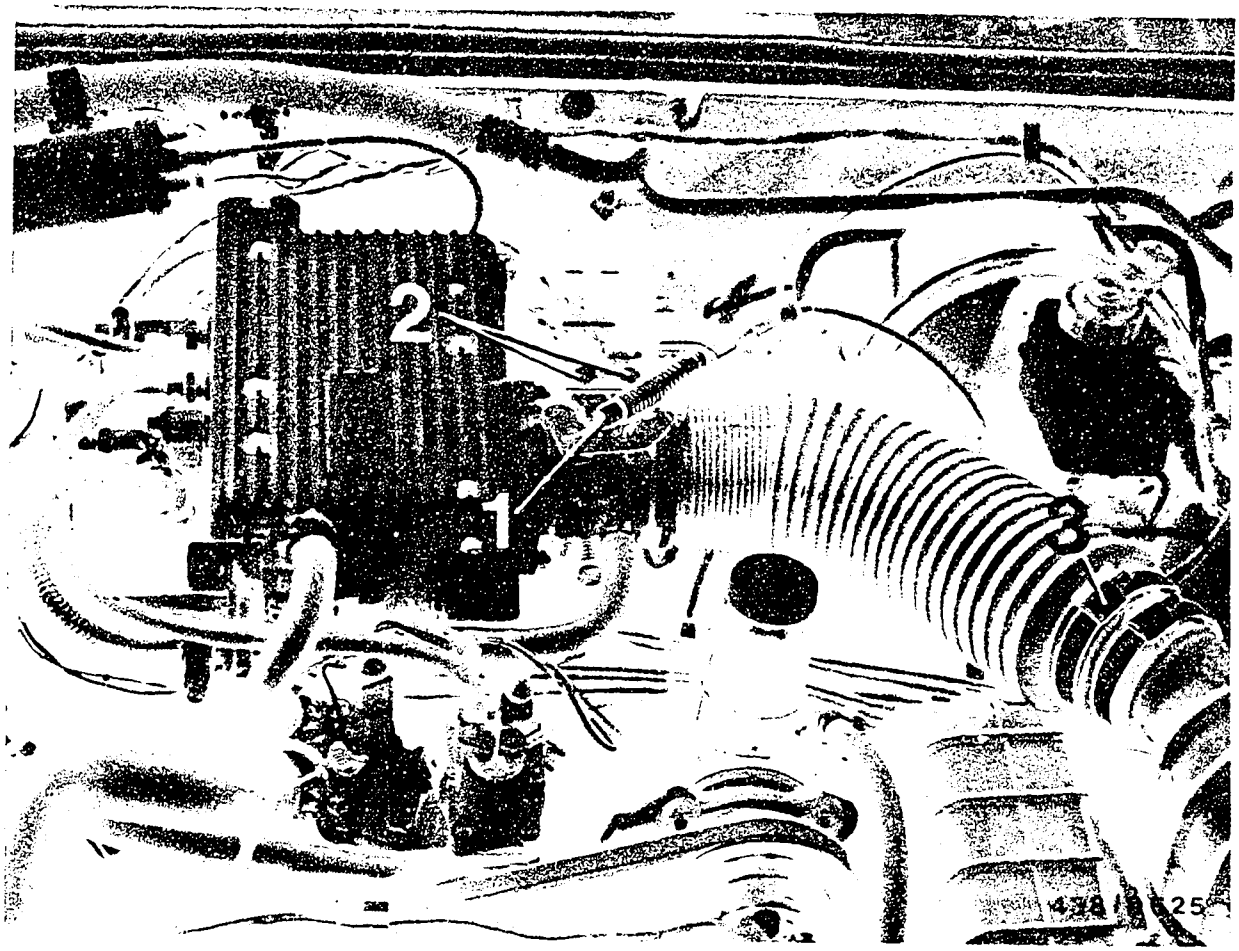
Basically, the tester consists of a steel housing containing 2 rotameter tubes with measuring ranges of 2...15 cm^3 and 10...180 cm^3, an 8-way valve for key operation (Item 3) and a 3-way stopcock (Item 1).

The small rotameter tube (Item 2) is used for the idle measurement while the large tube (Item 6) is used to measure the fuel delivery at part- and full-load. The particular rotameter tube to be used is connected by means of the 3-way stopcock. Using the 8-way valve, the fuel delivery of each cylinder is tested one after the other.

Attached to the tester are 8 hoses (Item 8), each terminated with an automatic connector. When the injection valves are withdrawn from their sockets on the engine they are attached to these connectors. Each automatic connector is fitted with a push valve so that no fuel can escape from connectors that are not in use (when 4- or 6-cylinder systems are tested).

The fuel is returned to the fuel tank through a hose (Item 7) about 5 m long.

The entire test is made with a closed circuit, i.e. no fuel escapes.



18.3 Remove the injection valves for testing:

In order to make the injection valves accessible, remove the complete air chamber as follows:

Remove the throttle-cable stop sleeve from the throttle-valve assembly and unhook the throttle cable (1). Remove the throttle-cable holder (2 fastening screws) (2).

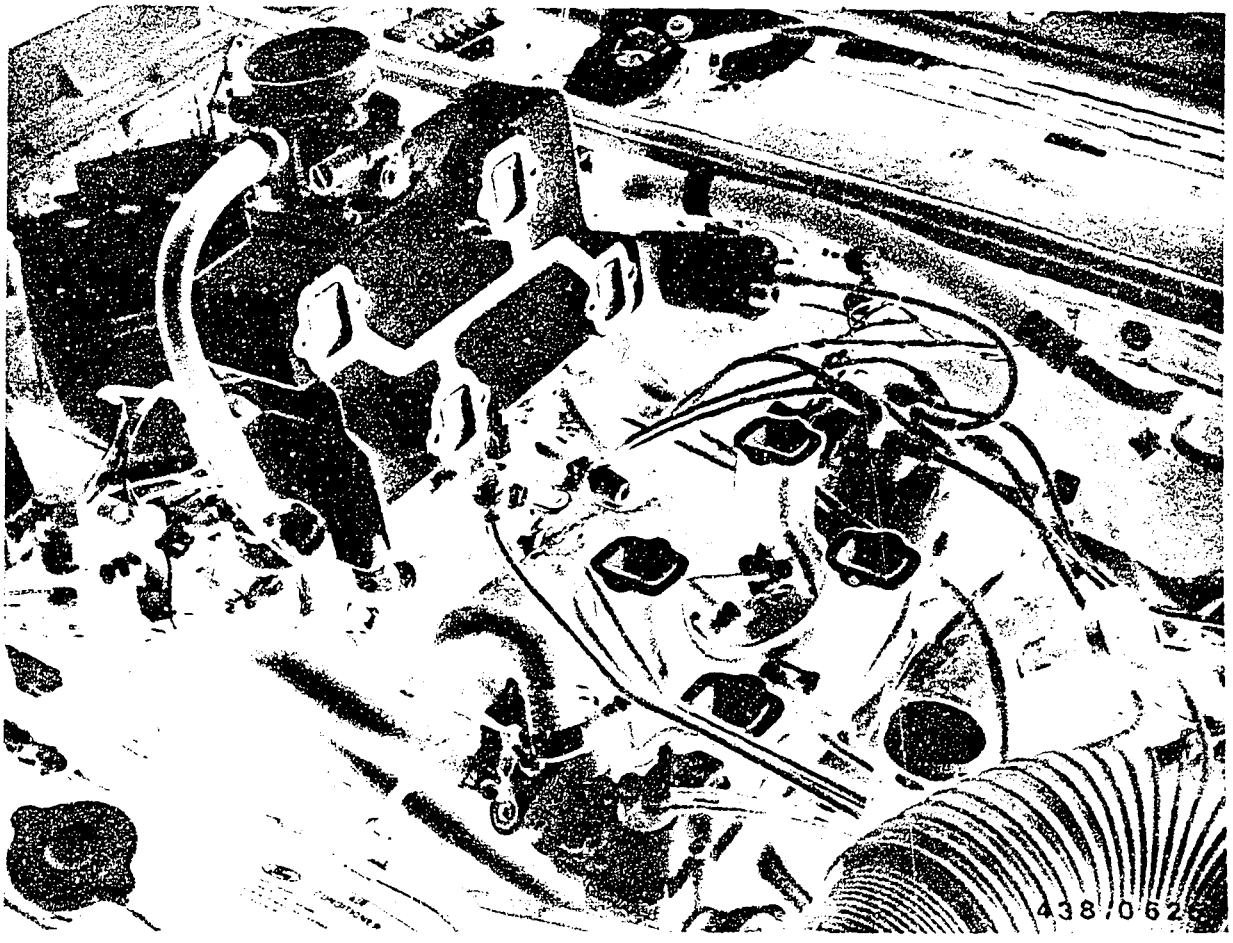
Loosen the air hose on the clamping band (3) and on the throttle-valve assembly and remove.

Unscrew and remove the following lines and hoses:

Plugs on warm-up regulator, auxiliary-air device, thermo-time switch and start valve.

Fuel line on start valve.

Vacuum hose on warm-up regulator.



Unscrew the 8 fastening screws of the air chamber. Lift off the air chamber, raise up at the side and fix in this position, possibly using a wire.

In order to perform a comparative measurement of deliveries using tester KDJE 7451, remove the injection valves without unscrewing the fuel-injection lines.

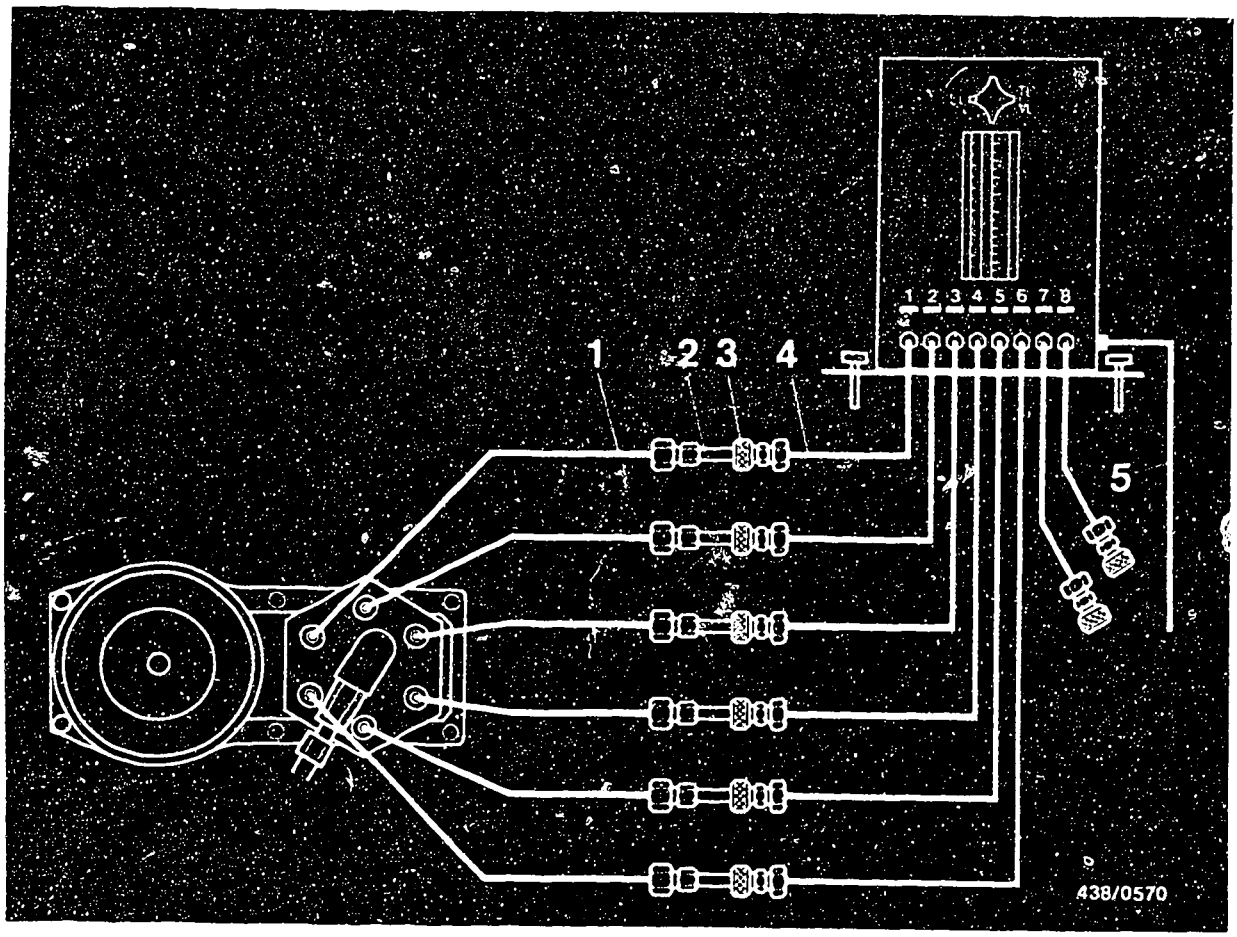
For the complete removal of the injection valves, first of all unscrew the fuel-injection lines, making sure to hold the fixed hexagonal section with a wrench.

Installation

Provide the injection valves with new O-rings and install.

Clean the joint surfaces on the intake pipes and on the air chamber and install the air chamber with a new gasket. Tightening torque for the 8 fastening screws: 7...10 Nm.

Re-fasten all connection lines.
Fit the throttle-cable holder on the throttle-valve assembly and hook in the throttle cable.



1 = Injection tubing
2 = Injection valves
3 = Automatic connectors
4 = Tester hoses
5 = Return line to fuel tank filler neck

18.4 Setting up and connecting the tester:

Set the tester up beside the engine on a solid base (e.g. on tester trolley KDJE-W 100) and align it with the built-in spirit level at the base of the tester.

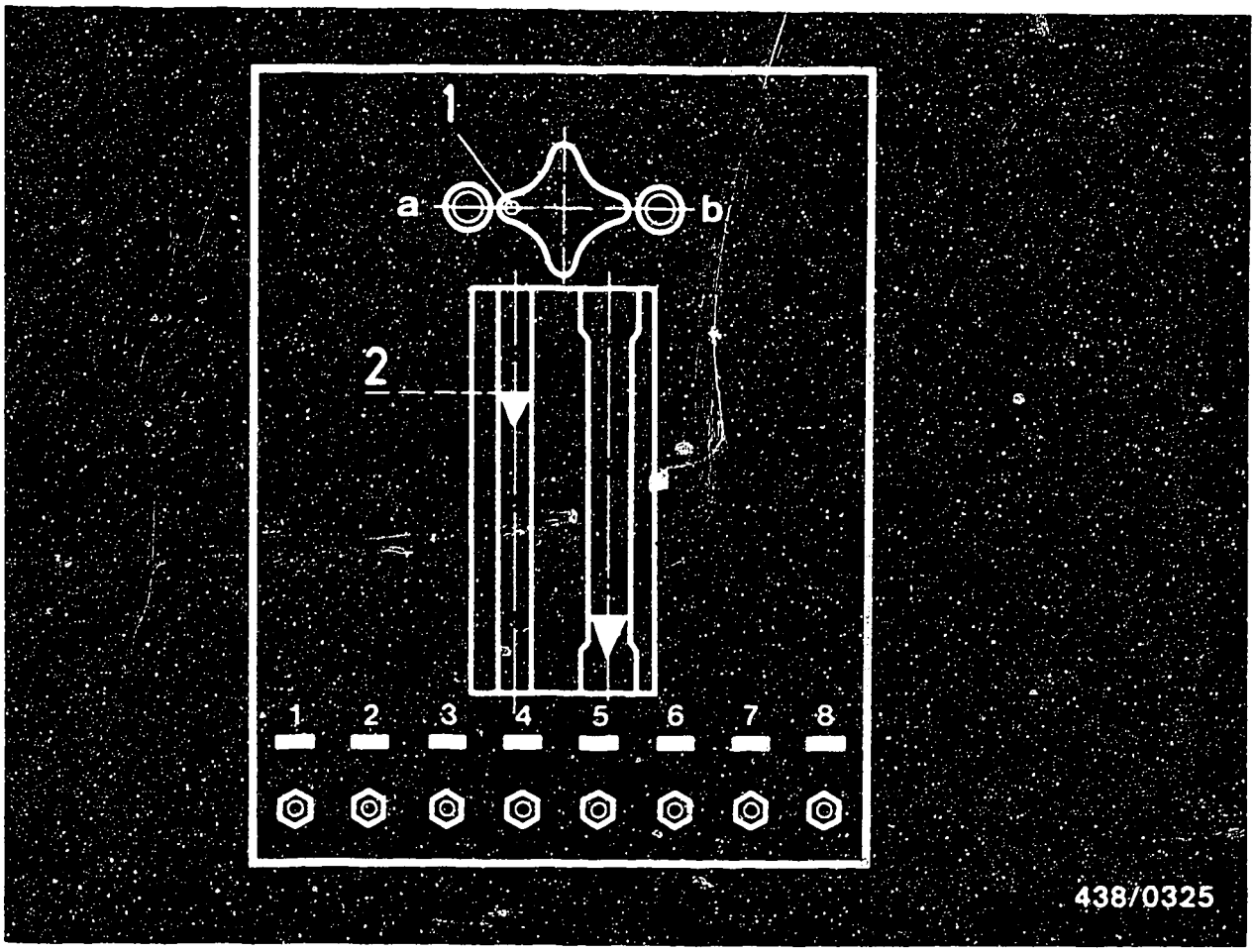
Clean the injection valves with a rag and insert injection valves in correct sequence into the automatic connectors of the first six tester hoses.

Note:
Insert the injection valves as far as they will go and tighten the knurled thumbscrews well so that the non-return valves of the automatic connectors are open fully.

Introduce the return hose of the tester into the fuel tank filler neck.

18.5 Bleeding the tester:

Remove the rubber hood so that air-flow sensor plate becomes accessible.
Remove the electric plugs from the warm-up regulator and the auxiliary-air device.
Switch on the electric fuel pump by bridging the electrical safety circuit.
Raise the air-flow sensor plate to the stop.
Press the keys on the 8-way valve one after the other, while simultaneously switching the 3-way stopcock until both rotameter tubes are bled.
Return the sensor plate to the rest position.



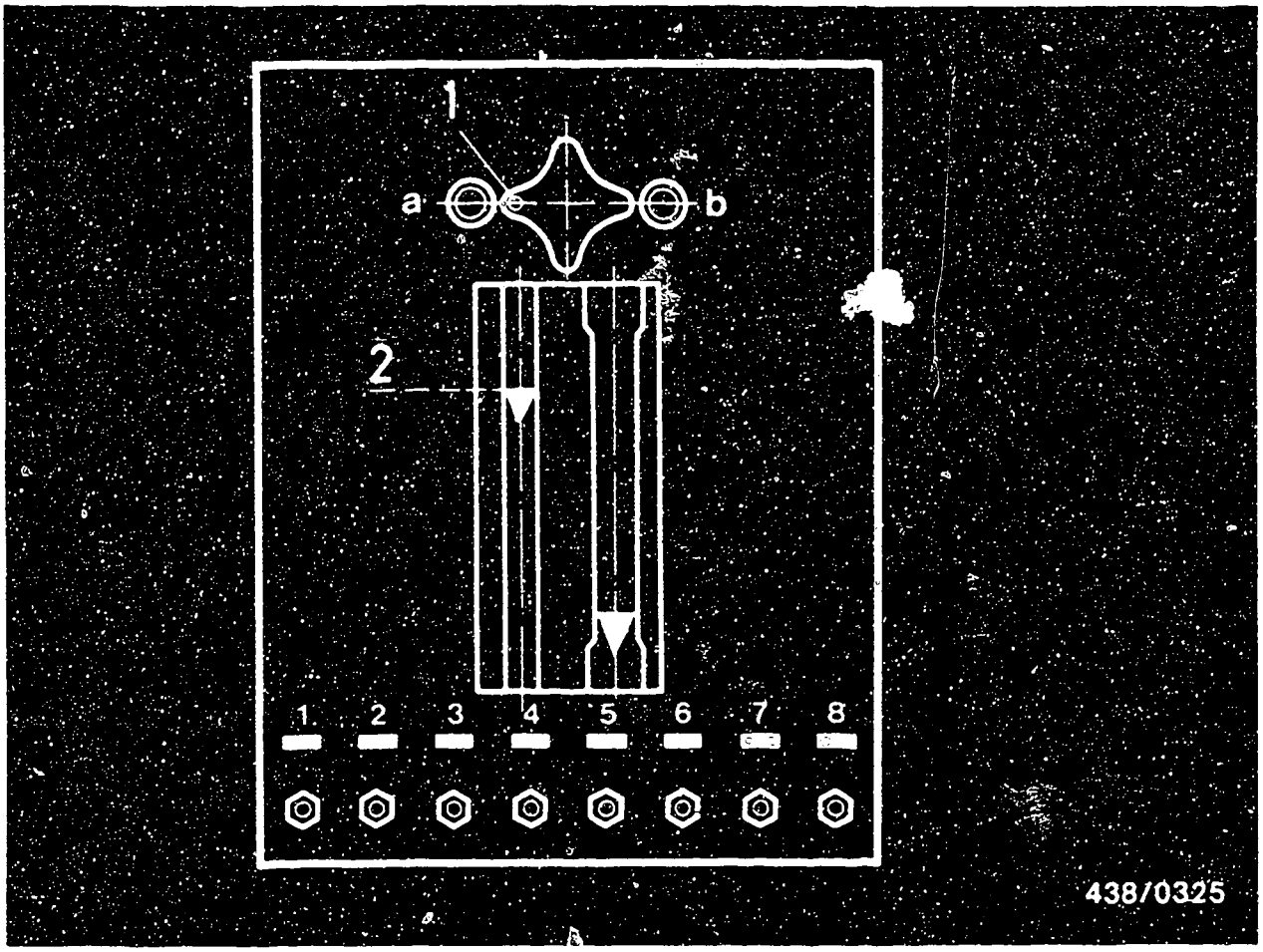
1 = White dot
2 = Measuring line

a = Idle
b = Part load/full load

18.6 Testing

The flow comparison measurement is made in the idle, part-load and full-load ranges.

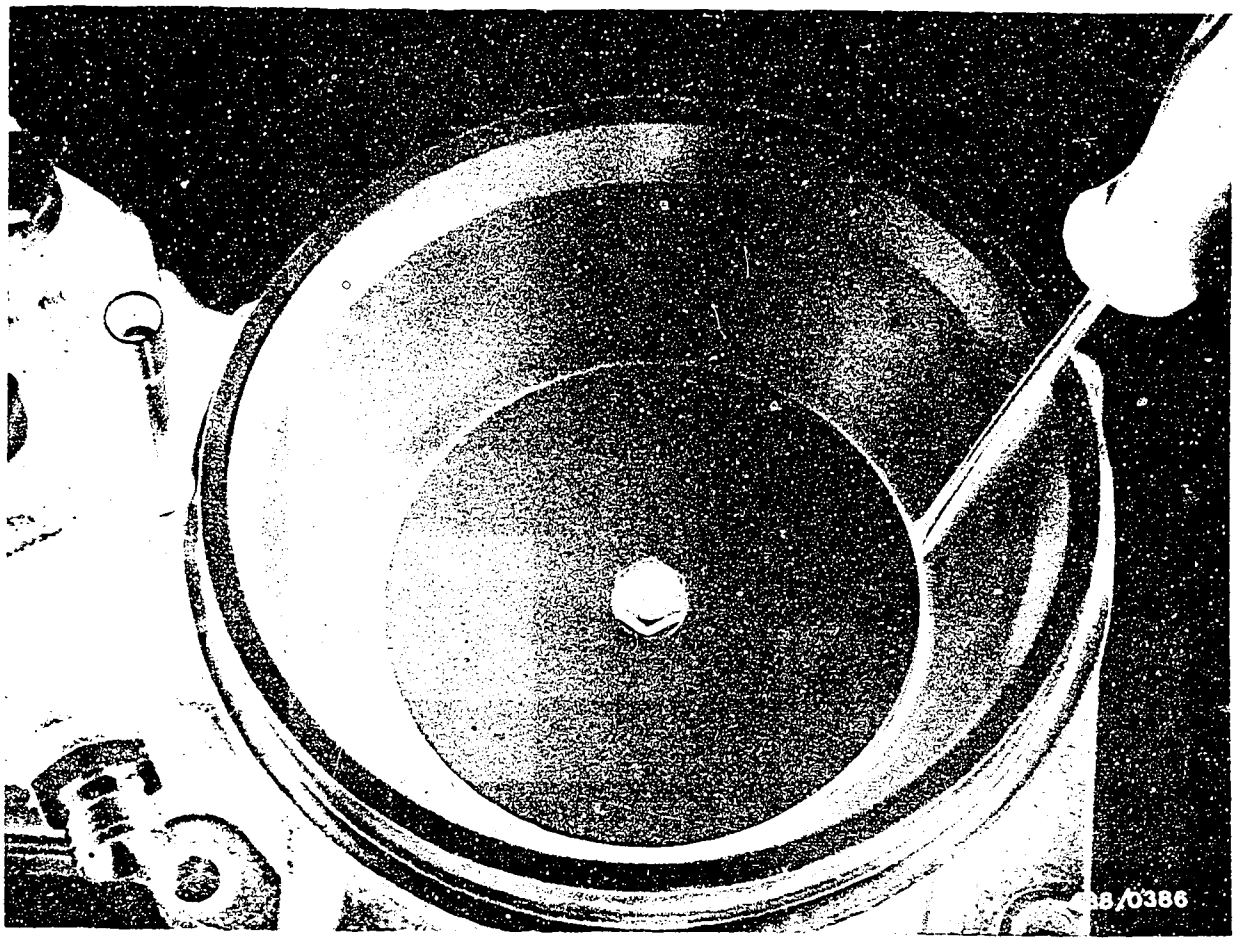
The small rotameter tube is to be used for the idle measurement (white dot to left on control knob), part-load and full-load measurements are made using the large rotameter tube (white dot to right).



1 = White dot
2 = Measuring line

a = Idle
b = Part load/Full load

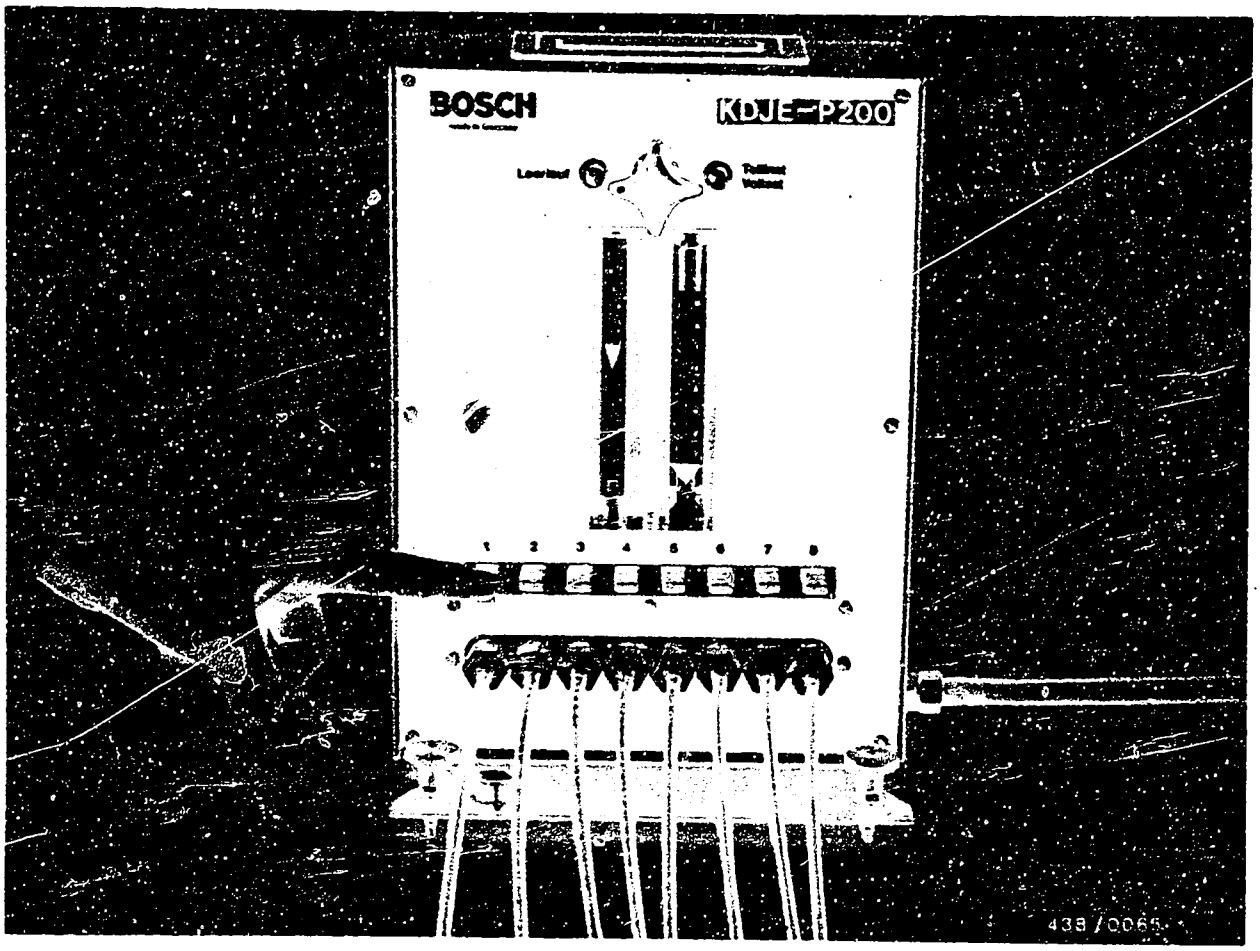
The delivered quantities indicated on the rotameter tubes are read off at the top edge of the conical float (Item 2).
On testers with a ball float the uppermost point of the ball is used for reading off. With each measurement be sure to wait until the float has reached its final position. This may take 20...30 seconds in the case of small deliveries.



The exact setting and locating of the position of the air-flow sensor plate for the various load ranges is done using a screwdriver (a small one for the idle position), which is inserted to an appropriate depth between the air funnel and air-flow sensor plate.

Procedure:

Switch on the electric fuel pump by bridging the electrical safety circuit.
Fixed numerical values are specified in the following test section for the maximum permissible fuel delivery differences for the individual load ranges.
The "set point" value always pertains to the fuel-distributor outlet with the lowest fuel delivery, i.e. in each case the outlet with the lowest delivery is to be first ascertained.



Press the key for outlet 1. Pivot the air-flow sensor plate until the corresponding rotameter tube approximately indicates the "set point" value. Fix the air-flow sensor plate in this position.

Test the remaining outlets in order to determine which outlet has the lowest fuel delivery.

Press the key for this outlet again, and set the delivery precisely to the "set point" by correcting the position of the air-flow sensor plate. Then fix the air-flow sensor plate in this position again.

Press the remaining keys one after the other, and determine the maximum fuel delivery of each outlet. A deviation in fuel delivery can only be above the "set point".

18.7 Test specifications

	Set point cm^3/min	Max. permissible fuel delivery cm^3/min
Idle	6.0	6.8
Part load	40.0	44.0
Full load	145.0	158.0

If, in testing, a too large difference is ascertained in one of the three load ranges, the test should for safety's sake be repeated.

If the result is confirmed, you should check whether the fault lies in the fuel distributor or in the injection valves.

To do this interchange the injection valves with the greatest and smallest difference.

If the result is still the same, the fault is in the fuel distributor. If the fault follows the interchanged injection valves, it lies in the injection valves.

Change defective fuel distributor and/or replace defective injection valves.

18.8 Final operations

Re-fit the injection valves properly. Also fit the rubber hood. Make sure that all lines are laid correctly. Re-connect the electrical safety circuit of the K-Jetronic properly.

Use a trial run to check that there are no leaks in line connections.

Finally check the idle-speed adjustment; if necessary, correct (Coordinates G4).

19. Idle-speed adjustment

19.1 Test conditions:

Warm the engine for adjusting the idle speed (oil temperature approx. 80°C).

Important note:

If the fuel-injection tubing or injection valves were loosened or removed, the engine should be warmed up under load. The low rate of fuel flow during idling is not always adequate to drive all the air out of the fuel-injection tubing.

The idle speed must not be adjusted when the engine is too hot, e.g. immediately after being raced or after a power measurement on the roller-type test stand.

In vehicles with an air-conditioner, this should be switched off to stabilize the engine speed during idle-speed adjustment.

Rotational-speed measurement with separate tester.

Check that the throttle-plate lever makes contact with idle stop. The cable should be free of tension.

19.2 Test specifications for idle adjustment:

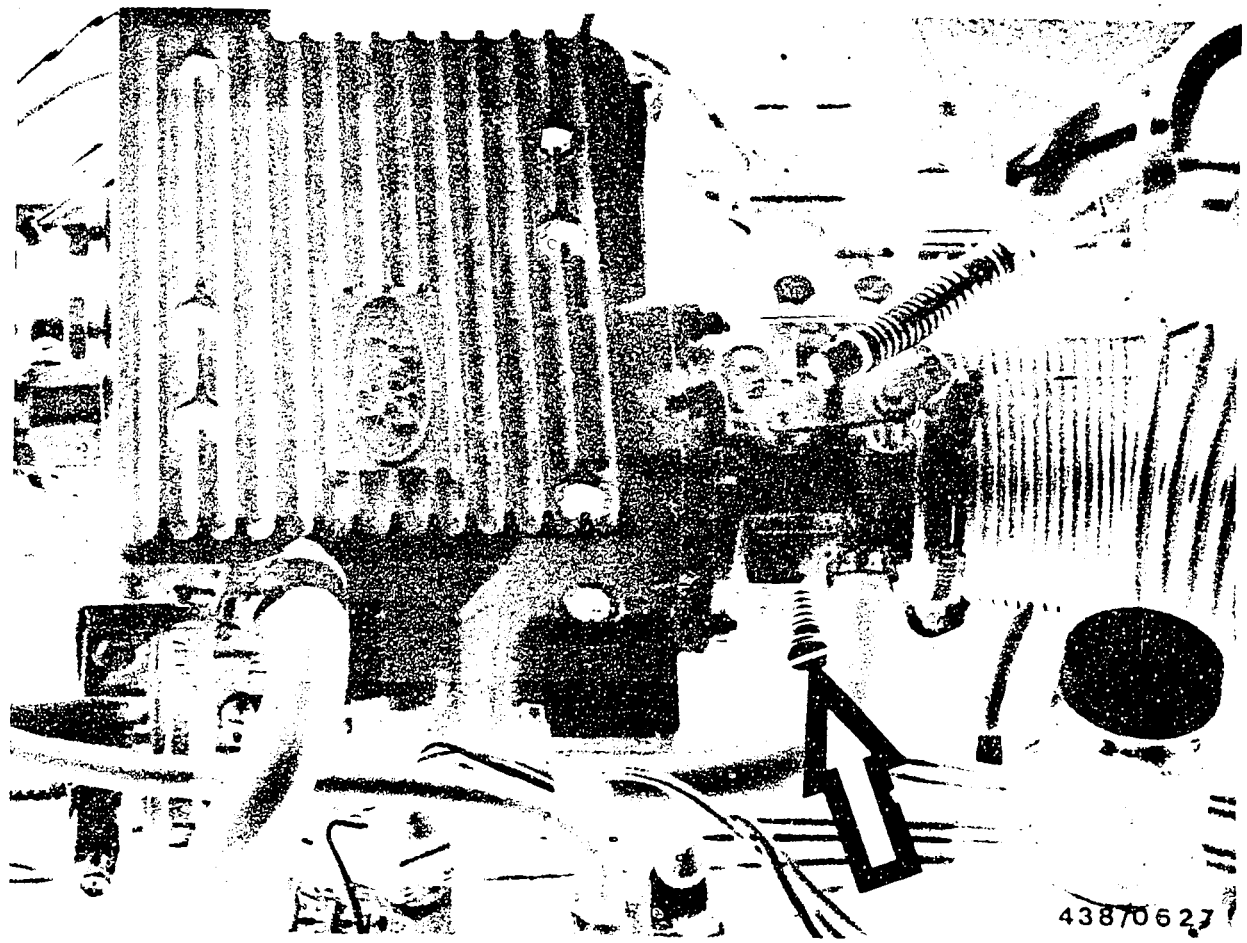
Idle speed:

All models with manually-shifted transmission:	875...925 min^{-1}
automatic transmission:	825...875 min-I

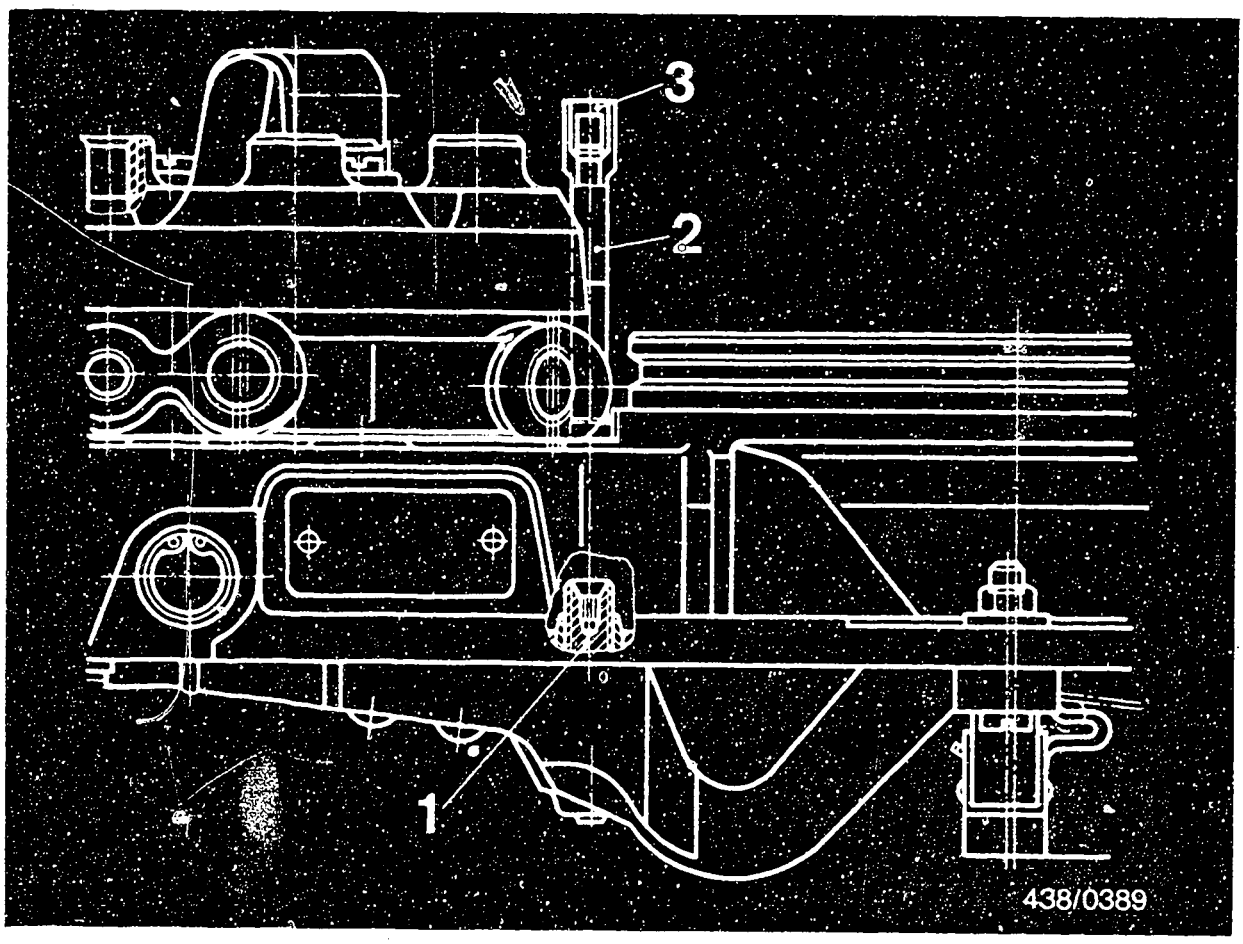
CO concentration: (% by vol.)

All models:	1.0...1.5

Note:
Before assessing the idle speed and CO concentration, let the engine run for approx. 30 seconds at a speed of 3000 min^{-1}.
Then wait until the readings have settled.
This procedure should be repeated if the adjustment operation takes longer than approx. 30 seconds.



The idle speed is adjusted at the bypass screw on the throttle-valve assembly (arrow).



Adjusting the CO concentration

The CO concentration is adjusted by turning the idle-mixture adjusting screw (1) in the mixture-control unit using the adjusting wrench KDEP 1035.

After removing the safety cap (3) of the guide tube (2), the adjusting wrench is passed through the guide tube and inserted into the idle-mixture adjusting screw.

Turning to the right = richer mixture
Turning to the left = leaner mixture

Caution:
Always make the adjustment from the lean side, i.e. if the mixture is too rich turn the idle-mixture-adjusting screw further to the left than necessary and then turn it to the right up to the setting required.

After every adjustment remove the adjusting wrench and accelerate the engine briefly, so that the air-intake system can cool off. Then wait until the indicator of the CO tester has stabilized. Never accelerate the engine with the wrench still in place as this could result in bending the control lever in the air-flow sensor.

19.3 Anti-tamper device for idle-mixture adjusting screw

In the Federal Republic of Germany, § 47 of the FMVSS/CUR, "Exhaust Gases and their Discharge", has been amended. This amendment order was printed in full in the Verkehrsblatt 13 of 15th July 1975.

Accordingly, all motor vehicles with externally supplied ignition produced as of 1 October 1976 must be provided with anti-tamper devices for the idle-mixture adjusting screw so that it is not possible to adjust the screw without destroying the anti-tamper device. The intention is to prevent non-experts from re-adjusting the idle setting and thus inadmissibly influencing the exhaust gas. Consequently, the anti-tamper caps may only be used in the workshop and must not be sold to customers for their own use.

These anti-tamper caps come in different colours. The cap to be used for the after-sales service of updraft air-flow sensors is red.
It can be obtained from Bosch under the part number 3 430 522 002.

The anti-tamper device for the air-flow sensor is removed and fitted using special tools (e.g. No. 131 090 from Cartool Co., Hans Schubert AG, Unterer Grasweg 88, D-8070 Ingolstadt).

After-sales Service

Technical Bulletin

Packaging of goods under warranty

438

K-Jetronic (CIS)

VDT-I-438/101 B
10. 1976

All components or assemblies of the K-Jetronic which are dispatched under warranty must be correctly and carefully packaged so that no further damage or impairments occur during transit, since these would not be covered by warranty.

Any fuel remnants must be removed from those K-Jetronic assemblies intended for dispatch, so as to eliminate any danger of fire during transit.

The intake openings and outlets of the assemblies must be sealed off with caps or plugs. As new products were fitted, the caps or plugs from these may be used.

The plunger of the fuel distributor is to be fitted with a protective cap of adequate size, or secured to the fuel distributor.

In addition, the assemblies are packed in tightly packed, well-sealed plastic sleeves. Fuel distributors and warm-up regulators are packed individually.

If components arrive damaged due to incorrect packaging or do not comply with these instructions, they can be returned and the warranty claim rejected.

BOSCH

Geschäftsbereich KH Kundendienst, Kfz-Ausrüstung

After-sales Service

Technical Bulletin

Securing of idle-speed adjusting screws

K-Jetronic (CIS)

438

VDT-I-438/102 B
11.1976

According to a statutory regulation, changes have been made to § 47 of the German traffic licensing laws concerning exhaust gases and their outlets. This regulation was printed in full in traffic law sheet 13 of 15.7.75 .

Consequently, all motor vehicles with external-ignition engines must have their idle-speed adjusting devices secured from the 1st October 1976, so that adjustment of the screw is impossible without destroying the securing device. This should stop unskilled people from adjusting the installation of the idle-speed system and thereby illegally influencing the emission values. As from now, securing caps can only be used in the workshop and cannot be sold to customers for their own use.

Securing caps are produced in various colors. For after-sales service the following caps and colors are used:

downdraft air-flow sensor	
Blue	securing cap is not available from BOSCH. Part number is DB 000.997.59 86 from the Deutsche Vergaser Gesellschaft K 34 520
updraft air-flow sensor	
Red	Part number 3 430 522 002

These stipulations are only valid in countries where ECE regulations (Economic Commission for Europe) apply. The air-flow sensors must however be converted for the use of these securing caps, as a matter of principle. The caps can also be used in countries not subject to ECE regulations, to prevent dirt penetrating through the pipe to the adjustment in the case of updraft air-flow sensors.

BOSCH

Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

After-sales Service

Technical Bulletin

SUPPLY PUMPS 0 580 ..

Overview of the non-return valves

Replaceable non-return valves

Part Number	Appropriate seal ring	Fitted in supply pumps
1 583 385 004	1 580 203 002	0 580 254 990, ..991,..998
.. 006	.. 002	.. 985
1 583 386 008	.. 001	.. 987, ..988,..989
.. 011	.. 001	.. 986, ..996
.. 014	.. 001	.. 992
.. 016	1 580 105 001	.. 970, ..971,..972, .. 973, ..974,..980

Parts sets (comprising non-return valve complete with seal ring)

1 587 010 001	-	0 580 254 992
1 587 410 901	-	.. 978, ..982 FD823→

Supply pumps fitted with non-replaceable non-return valves

0 580 254 975, ..976, ..977, ..979 and ..982 → FD 822

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

After-sales Service

Technical Bulletin

FIRMLY FITTED NON-RETURN VALVE

Repairs
fuel pumps 0 580 254 ...

VDT-I-438/107 En
5.1980

Previously fuel pumps with non-exchangeable non-return valve (see VDT-I-438/104 En) had to be exchanged completely in cases of leakage in the non-return valve.

If the fuel pump is in working order and only the non-return valve leaks, there is now the possibility of repairs as part of after-sales service. 2 parts sets have been produced for this purpose, they contain, amongst other things, a tube fitting with built-in non-return valve.

Before using the parts set the installation conditions should be checked. The defective non-return valve can remain in the fuel pump which does not have to be dismantled for fitting the parts set. Before disconnecting the fuel lines the pressure fittings of the fuel pump and the fuel lines should be thoroughly cleaned.

Description and fitting

Parts set 1 587 010 003 for fuel connection with inlet union.

Screw the tube fitting (short side) with the thick flat seal ring into the pressure fitting and tighten. In doing so press against the hexagon of the pressure fitting with a wrench. Place the thin flat seal ring, the fuel-line inlet union and the other flat seal ring on to the long side of the tube fitting and tighten with the hexagon cap nut. Run the engine and check that there are no leaks in the connection.

Parts set 1 587 010 004 for fuel connection with nipple and union nut.

Screw the tube fitting with flat seal ring into the pressure fitting and tighten. In doing so press against the hexagon of the pressure fitting with a wrench. Screw the fuel line to the tube fitting with a union nut and tighten. Run the engine and check that there are no leaks in the connection.

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After-sales Service

Technical Bulletin

HOT-STARTING PROBLEMS

438

VDT-I-438/105 En
3.1980
Replaces Ed. 2.1980

K-Jetronic

Hot-starting problems can occur in various vehicles fitted with K-Jetronic. This means that when an engine is switched off whilst still hot and then switched on again after a short period, it does not start as well as it should.

The engine, the ignition system and the K-Jetronic system in these vehicles should be carefully checked. With the K-Jetronic particular attention should be paid to the:

complete system (in case of leaks),
injection valves (in case of leaks),
correct position of the air-flow sensor plate (rest position).

Instructions can be found in the vehicle-related repair manuals VDT-W-438/5.. .

If the engine still does not start satisfactorily when hot, even after checking, a timing relay can be fitted in K-Jetronic systems which are not equipped with a solenoid valve for reducing the control pressure as additional starting help.

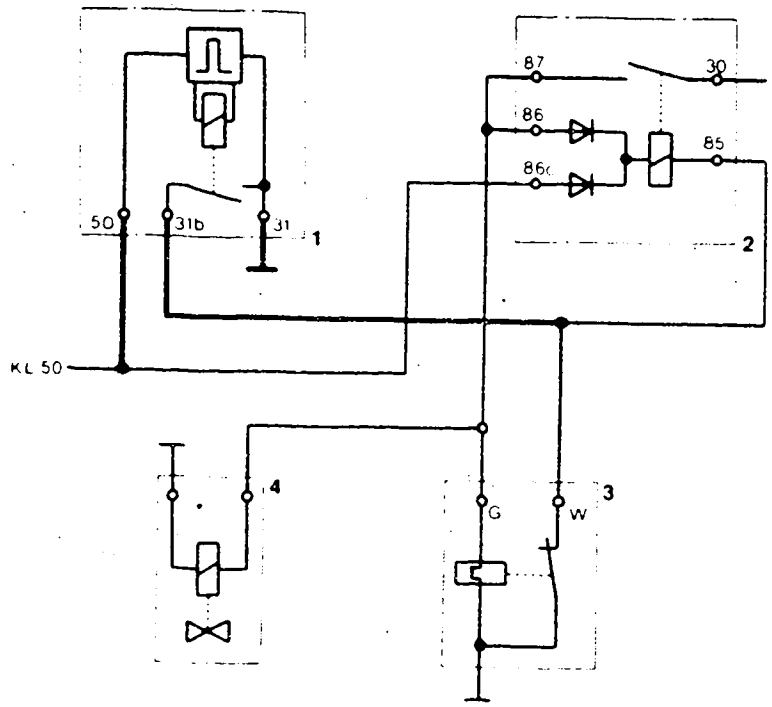
Timing relay 0 340 000 003 controls the start valve during hot starts. The start valve then injects extra fuel intermittently (sometimes cutting out completely.

The timing valve is fitted according to the wiring diagram (see reverse side). The fitting of this relay will be charged for.

After fitting the timing relay starting should be carried out as follows:

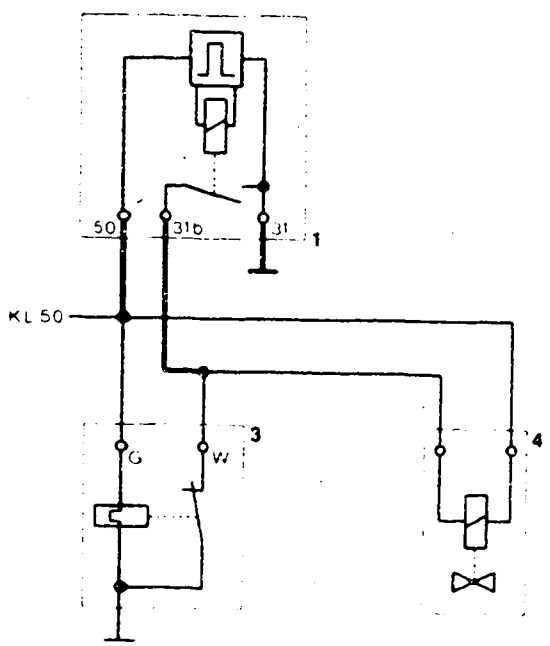
Vehicles with start valve in intake manifold - with open throttle valve,
Vehicles with start valve in idle duct - with closed throttle valve.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung



K-Jetronic system with post-injection relay

1 = Timing relay 0 340 000 003
2 = Post-injection relay
3 = Thermo-time switch
4 = Start valve



K-Jetronic system without post-injection relay

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